THE

Malayan Agricultural Journal.

NOVEMBER, 1933.

EDITORIAL.

The Malayan Coconut Industry.

The coconut industry is at the present time of very great importance in Malaya, as with the rubber industry in a depressed state the need for other valuable exports is obvious, while the value to the Malay raiat of a money producing commodity, such as copra, is unquestionable.

Two articles dealing with the coconut industry are included in the present number of this Journal. The first article by Dr. H. A. Tempany, C.B.E., gives a review of the industry as a whole in the year 1932, and the second article by F. C. Cooke and H. J. Simpson describes the progress in Malaya of the efforts which have been made to improve the quality of copra produced by small-holders.

Copra is bought and sold on a standard estabished, for each country of origin, by the average quality of copra received from that country. On the majority of the large estates in Malaya the copra produced is of good quality, but there is need for very considerable improvement in the quality of copra produced by the small-holders, since the admixture of such copra in the exported product lowers the average quality.

The Department of Agriculture has paid considerable attention to the question of an all round improvement of copra, particularly that produced by small-holders, and the results to date are encouraging.

It is not improbable that, since much of the copra produced in Ceylon is now being absorbed by the Indian market, Malayan copra may tend to replace Ceylon copra on the World's markets, particularly if the standard of the exported product can be improved. In this connection it may be mentioned that the copra exported from Malaya is not all produced in this country; a considerable quantity, particularly of low-grade copra, is annually imported for re-export from other countries.

Copra exported from Malaya is graded by the exporters as F.M. (Fair Merchantable), the better quality, being graded as F.M.S. (Fair Merchantable Sundried). The poor quality copra imported into Malaya increases the quantity of inferior grade copra exported, and it is therefore desirable that the local efforts aiming at improvement should be maintained in order to raise the average quality of the copra exported as Malayan produce.

The success of the initial experiments, conducted by the Department of Agriculture in the Kuala Selangor District with the object of stimulating interest in the kiln curing of copra by Malay small-holders, has already had a marked influence, on the standard of copra produced in the coastal district of Selangor. Furthermore, the financial results to the small-holders concerned have been highly satisfactory.

Copra manufacture by small-holders is not confined to Selangor but is becoming an increasingly popular practice in other coconut areas in the Peninsula. There is a tendency, however, on the part of the producers to be content with the enhanced prices offered for copra of poor quality as compared with the price received for nuts, and until the marketing side of the industry can be better organised so that good quality copra produced by small-holders in all the districts will obtain a premium over poor copra, progress towards the ideal of raising the average quality of Malayan produced copra will be delayed. It is felt that in order to establish copra manufacture amongst Malay small-holders on a sound basis, the tendency to be content with the manufacture of a low grade product should be discouraged and the producers stimulated to manufacture high grade copra since efforts to organise the marketing of the product are only likely to be fully successful if adequate supplies of good copra are available in the districts where small-holder's copra is produced.

Manurial Treatment of Grass.

While a considerable amount of work has been carried out in other countries on the effect of manuring and frequency of cutting upon the yield, composition and feeding value of grasses, the investigations have been concerned chiefly with natural pastures.

In Malaya, natural pasture is the exception and, in order therefore to provide suitable fodder for feeding stock, pure strains of grasses must be cultivated.

In the article included in the present number entitled "Manurial Experiments with Guinea Grass at Serdang" Messrs. V. R. Greenstreet and J. L. Greig record the preliminary results of an investigation, which it is hoped will have far reaching consequences in effecting an improvement in the general quality of grass used for feeding stock in Malaya.

Although, as will be seen, the figures for yields only cover a period of six months, some interesting conclusions can already be drawn, particularly as regards the correlation between type of soil and interval of cutting.

As pointed out in the text, the present article must be regarded more in the nature of a progress report, different aspects of the question being considered as more details become available. For example, in the next article on the subject it is hoped to discuss the questions of yield and seasonal variation combined with interval of cutting, also that of the feeding value of the grass.

In conclusion, it is pointed out that the results of the investigation should be of special interest to agricultural workers in other tropical countries, in which similar conditions as regards scarcity of natural pasturage exist, since, as far as is known, little attention has been given to the question of the cultivation of pure strains of grasses under controlled conditions.

Agricultural Shows. Perhaps one of the most striking changes that has occurred during the past two years in Malaya is that in the attitude adopted towards agricultural shows, particularly small district shows.

These functions have for many years past enjoyed a certain popularity in this country and have usually been organised on more or less definite lines; the Kuala Lumpur Exhibition annually held by the Malayan Agri-Horticultural Association with the collaboration of the Department of Agriculture has been regarded as a central event of the year in this respect, while small shows in the district occupied the position of ancillary and supplementary events. The popular attitude towards shows was in general to regard them as being in a certain degree beneficial, but as more particularly possessing importance as social events which helped to bring people together from distant points, tended to induce good-will and generally brightened up the somewhat dull and monotonous existence of the inhabitants of the countryside.

Viewed from this angle it is not altogether surprising that, when the financial depression first made itself felt, the general reaction on the subject of agricultural shows was, in the first instance, to regard them as being more or less in the nature of luxuries which it was necessary to dispense with until better times supervened.

As an index of this feeling it may be pointed out that in 1931 the Kuala Lumpur Exhibition was the only one held in the country; considerable opposition to the holding of this show was exhibited and it only took place because the Malayan Agri-Horticultural Association and the Department of Agriculture strongly held the opposite view, *viz*:—that shows were entitled to be regarded as possesing far more importance than a considerable section of the public was inclined to accord them.

Since that year a very considerable change in the popular attitude has taken place. It has now come to be regarded as a somewhat trite commonplace to stress the importance of broadening the basis of Malayan agriculture and particularly the agriculture of the small-holder; but, be this as it may, there is no question of its truth and the measures that can be adopted to secure this end are of importance.

It is obviously essential that efforts directed to this end should be correlated and organised along defined channels and it has to be remembered that the broadening process must take place in at least three directions *viz*:—

(1) The increasing of the number of crops grown and the crop products turned out in commercial quantities;
(2) The increasing of the area under products other than rubber;
(3) Possibly the most important of all,—the raising of the general level of quality of Malayan produce other than rubber.

At the present time a definite policy tending to bring about improvement in all three directions is being pursued; it comprises a large number of lines and as part of this programme agricultural shows definitely hold an important place. It must be realised that, if one leaves on one side rubber and palm oil, there is hardly a product that is produced in Malaya which is capable of competing on terms of equality with the best class of produce on the market. It is, therefore, as part of the plan for enlarging the range and improving the quality of the agricultural produce of small-holders that shows have their particular interest and value. To cite a few examples Malayan small-holders' copra, rice, tapioca, coffee and arecanuts all fall in quality far below the highest standards demanded by the market and it is essential that if progress is to be achieved that the quality should be raised. It is obvious, of course, that this can only be achieved by patient and painstaking work in a variety of directions. It necessitates experiments, instruction and demonstrations, the organisation if necessary of markets and the introduction of grading. Efforts are being made along all these lines, but conjoined with them shows and particularly small district shows can and do play a most important and valuable part.

That this is becoming realised is evidenced by consideration of the figures for the number of shows held of late years. As previously pointed out in the year 1931 the only show held in the whole of Malaya was the Kuala Lumpur Exhibition. In 1932 in addition to the Kuala Lumpur Exhibition four district shows were held. In 1933 in addition to the Kuala Lumpur Exhibition eleven district shows were held; this is believed to be a record for the number of district shows that have been held in Malaya in any one year. It is hoped that as time goes by and the real purpose and benefit of shows becomes more and more known the number held annually will continue to extend.

It is pleasing to notice that in places where these efforts have been started definite advances are already visible both in the quality and variety of produce exhibited and in the number of exhibits, but it is important to realise that shows can only exert their full effect if the policy of holding them at regular interval is steadily pursued. Sporadic effort is of comparatively little value. It is also important that so far as possible there should be some form of organisation which can indicate suitable methods to be followed in the organisation of shows and provide standards for judging produce and help so far as possible to keep

shows on sound lines. The work of the Malayan Agri-Horticultural Association coupled with that of the Department of Agriculture in this direction is already beginning to show signs that it is exerting an appreciable influence; if guidance is not forthcoming mistakes frequently occur which could readily be avoided if full information was available.

An interesting additional possibility in connection with shows is that of using them as centres for crop competitions and making the district shows serve as feeders for All-Malayan Competitions to be held as a culminating point in connection with the Central Exhibition in Kuala Lumpur. A scheme for an All-Malayan Rice or Padi Competition organised on these lines is at present under consideration by the Malayan Agri-Horticultural Association working in collaboration with the Agricultural Department and the various administrations. We shall hope to discuss this matter further in a subsequent issue of this Journal.

Original Articles.

COCONUTS & COPRA IN MALAYA IN 1932.

BY

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During 1932 market conditions for coconut oil and coconut products continued to be adversely affected by the economic conditions which prevailed, although prices were maintained at a somewhat higher level than in 1931.

Coconut Products.

Prices. The Singapore price of 'sundried' copra remained constant throughout the year at between $5 and $6, with the exception of the period from the middle of February to the middle of March, when the price rose to $7 a picul for a short time.

The average price of 'Sundried' for the year was $5.74 per picul as compared with $5.09 in 1931. 'Mixed' averaged $5.22 per picul in 1932 as compared with $4.64 in the previous year.

TABLE I.

Average Monthly Prices of Malayan Sundried Copra during 1932. *

1932	London Per ton £	s	d	Singapore Per picul (133⅓ lbs.) $
January ...	15	5	0	5.73
February ...	15	4	6	6.26
March ...	16	14	4	6.17
April ...	16	16	8	5.67
May ...	15	0	0	5.48
June ...	14	16	10	5.17
July ...	13	10	0	5.40
August ...	13	18	4	5.55
September ...	14	11	3	5.76
October ...	14	16	3	5.75
November ...	14	11	4	5.81
December ...	14	15	0	5.72
Average for 1932 ...	15	0	6	5.74

*"Tropical Life" Weekly Copra Prices.

While prices improved in 1932 over the very low prices of the previous year, it must be remembered that the 1932 prices are much below those of previous years—'Sundried' in 1930 averaged $7.88, in 1929 $9.65 per picul, while the average annual price per picul for the years 1922—1928 was $11.26.

The average price of coconut oil in 1932 was $13 per picul as compared with $9.69 per picul in 1931.

'Poonac', or coconut oil cake, averaged $2.10 per picul in 1932 as compared with $1.82 per picul in 1931.

World Production.*

An estimate of the world production of copra based on the figures for the total acreage under coconuts in the World, which in 1930 amounted to about 7¼ million acres, and the assumption that 2½ acres of palms yield 1 ton of copra shows that about 3 million tons of copra are now produced annually. It is estimated that over 40 per cent. of the total production is consumed in the countries of origin.

World Exports.

Although Netherlands India is by far the largest exporter of copra, when exports of copra and coconut oil are combined, the greatest share of the world supply of both commodities entering international trade is that of the Philippine Islands which was 29.3 per cent. in 1930 as compared with 28.6 per cent. from Netherlands India in the same year.

The next most important are those of the British South Sea Islands, Ceylon and Malaya which supplied 11.6, 11.1 and 8.7 per cent. respectively.

Areas in Malaya.

A close census of coconut areas was made in 1930. No further census has been deemed necessary in subsequent years. The following figures (Table ii) are based on the 1930 census, with amendments to include definite new areas opened since that year.

Production in Malaya.

No organisation exists for estimating the total quantity of copra produced in Malaya. Imports from Netherlands India are considerable and are used both in the production in Malaya of coconut oil and for grading with the produce of Malaya for re-export.

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*"Survey of Oil Seeds and Vegetable Oil", Vol. II, Empire Marketing Board Handbook No. 61.

TABLE II.

AREA PLANTED WITH COCONUTS IN MALAYA 1932.

	STATE OR TERRITORY.	IMMATURE.			MATURE.			Total (Acres).
		On Holdings of		Total Immature area (Acres).	On Holdings of		Total Mature area (Acres).	
		Over 100 acres each.	Under 100 acres each.		Over 100 acres each.	Under 100 acres each.		
Federated Malay States.	Perak	11,476	14,196	25,672	37,664	45,604	83,268	108,940
	Selangor	5,398	35,809	41,207	32,429	36,948	69,377	110,584
	Negri Sembilan	155	1,121	1,276	914	3,776	4,690	5,966
	Pahang	256	3,948	4,204	2,456	7,870	10,326	14,530
	Total F.M.S. ...	17,285	55,074	72,359	73,463	94,198	167,661	240,020
Straits Settlements.	Singapore	...	400	400	3,159	4,841	8,000	8,400
	Malacca	...	2,330	2,330	...	10,255	10,255	12,585
	Dindings	893	1,696	2,589	1,764	2,177	3,941	6,530
	Province Wellesley ...	2,183	1,438	3,621	15,415	17,785	33,200	36,821
	Penang	308	359	667	2,936	9,923	12,859	13,526
	Labuan	...	1,958	1,958	...	1,238	1,238	3,196
	Brunei	...	681	681	...	689	689	1,370
	Christmas Island	...	...	...	...	19	19	19
	Total S.S. ...	3,384	8,862	12,246	23,274	46,927	70,201	82,447
Unfederated Malay States.	Johore	428	32,622	33,050	2,873	129,127	132,000	165,050
	Kedah	361	8,725	9,086	492	17,382	17,874	26,960
	Perlis	...	1,434	1,434	...	2,527	2,527	3,961
	Kelantan	...	...	...	...	...	...	57,271
	Trengganu	...	...	...	...	...	...	25,000
	Total U.M.S. ...	...	...	...	...	...	...	278,242
Grand Total	Malaya							600,709

It is probable that local consumption of coconut oil, mainly for culinary purposes, is considerable, so that the nut equivalent of net exports is the most satisfactory measure for gauging the progress of the industry. The comparative figures in this respect for the past 5 years are shown in Table III.

TABLE III.

Nut-equivalent * of Net Exports from Malaya of Coconut Products.

Year	Coconut Fresh	Copra	Coconut Oil	Total
	Thousands of Nuts			
1928	18,871	478,140	80,307	577,318
1929	15,735	562,145	70,890	648,770
1930	14,669	510,070	76,969	601,708
1931	14,715	502,840	80,665	598,220
1932	10,812	487,320	96,947	595,079

The net exports of products in 1932 and a comparison with the two previous years are given in Table IV.

In addition, the net exports from Malaya in 1932 of oil cakes (mainly coconut oil cake), amounted to 2,772 tons, valued at $84.777 as compared with 906 tons, value at $12,660 in 1931.

* Equivalents: 1 ton oil = 8,125 nuts.
1 ton copra = 5,000 nuts.
1 ton nuts = 1,400 nuts.

TABLE IV.

Net Exports of Coconut Products from Malaya.

	Fresh Coconuts		Copra		Coconut Oil		Total Value Net Exports
	Tons	$	Tons	$	Tons	$	$
1930	10,478	406,921	102,014	15,307,511	9,472	2,359,357	18,073,789
1931	10,511	245,314	100,563	9,662,785	9,928	1,642,250	11,550,349
1932	7,723*	313,346	97,464	10,766,633	11,932	1,982,245	13,062,224

* Nuts exports were 10,812,300 nuts, equal to 7,723 tons on basis of 1,400 nuts per ton.

The value of the exports of coconut products shows some improvement over that of the previous year, but is less than the annual average of the years 1923—30 inclusive by no less than $8,730,546 or 40 per cent. below this average.

Trade.

The trade in coconut products was well maintained in 1932. The gross imports and values are as stated in Table V.

TABLE V.

Gross Imports into Malaya of Coconut Products.

	Fresh Coconuts		Copra		Coconut Oil		Total Value Imports
	Tons	$	Tons	$	Tons	$	$
1930	308	6,244	89,689	10,935,053	30	6,231	10,947,528
1931	1,727	28,105	87,268	6,745,576	250	40,215	6,813,896
1932	1,889	50,797	99,934	8,380,131	455	75,561	8,507,489

It follows that only about 50 per cent. of the copra exports of Malaya is the produce of this country, practically the entire remainder originating from Netherlands India.

A feature of the trade in coconut products in recent years, and particularly in the year under review, is the steady increase in the local production and export of coconut oil. The net exports in 1932, *viz.* 11,932 tons, constitutes a record. The average annual net exports for the years 1923—31 inclusive was 8,508 tons. The percentage share of coconut oil in the aggregate world exports was 19.8 in 1926, 23.6 in 1927, 22.3 in 1928, 26.4 in 1929 and 23.2 in 1930.

The copra exports from individual States in Malaya for the year 1932 are not at present available. The exports of copra from the Federated Malay States in 1932 were 74,085 tons, as compared with 65,583 tons in 1931. The principal producers were Perak with exports of 46,806 tons in 1932 as compared with 41,259 tons in 1931 and Selangor with 26,655 tons exports in 1932 and 23,683 tons in 1931.

It may be inferred therefore that the increase in net exports of coconut oil of 2,000 tons is accountable chiefly to the more extended use of copra from the Unfederated Malay States and Straits Settlements for this purpose.

It may be of interest to allude here to a misconception regarding the question of improvement of Malayan copra which has apparently gained rather widespread acceptance.

Malayan copra comes on to the markets of the world in two grades, *viz.* F.M.S., *i.e.* Fair Merchantable Sundried and F.M., Fair Merchantable.

The view appears to exist among a certain section of the trade in London that efforts to improve Malayan copra should be directed to the improvement of the lower rather than the higher grade. This is due to a misunderstanding of the position, inasmuch as these two grades represent not the grades of copra as produced on estates and small holdings, but export grades which are artificially created at the point of shipment by the exporters themselves.

Copra coming from estates and from small producers is delivered to the buyers' godowns at the ports as two grades, *viz.* sundried and mixed. At the ports it is regraded by the exporters; it may be said that practically all the sundried copra goes forward as F.M.S., but the mixed copra is divided between the two the better quality pieces being graded as F.M.S., and the rejects as F.M.

It is further to be borne in mind that, as has been already shown, copra exported from Malaya is by no means entirely produced in the country, quite a considerable proportion, especially of the lower quality, is imported from Netherlands India, regraded at the ports and re-exported and this goes to swell the exports of F.M. copra which comes on to the markets as Malayan produce but in reality is only partially so.

In these circumstances it will be understood that the suggestions which have been made that attention should be focussed on the production of improved quality F.M. copra are beside the point; because the result of such efforts will be that any improvement in quality effected will entail that instead of being graded as F.M. copra, improved produce will be graded as F.M.S. by the exporters.

It is as well that this point should be clearly grasped as apparently the true significance of the position is not fully appreciated outside Malaya.

Conditions on Estates.

Increased attention has been paid to a number of points in relation to the coconut industry on estates.

The practice of clean weeding is showing signs of being superseded by a system of cover cropping on a number of estates, while others are adopting a system of periodical slashing of undergrowth; in certain instances, the adoption of these methods has been followed by marked improvement both in appearance of palms and in their yields.

Coconuts in Malaya are for the most part grown on heavy clay soils thereby markedly differing from the conditions under which they are cultivated in the majority of coconut producing countries.

In these circumstances drainage problems are of considerable importance and, as most of the coconut lands are low lying and not infrequently decidedly acid, the question of providing adequate drainage often presents difficulty.

Moreover the question of water movement is of importance under these conditions. It is well known that, in order to secure the best results, coconuts should be planted under conditions in which there is a slow but steady movement of subsoil water. To secure this end certain estates have adopted a system of alternately filling and emptying drains at regular intervals thereby promoting movement of soil water and helping to lower acidity by flushing out the soil.

The cultivation of dwarf coconuts presents a special series of problems in this respect; fair areas of palms of this type are established on certain estates; of the three varieties the green dwarfs have been shown to give the best results but even with these, results are very variable. Evidence accumulated during the year appears to indicate that drainage questions have a good deal to do with the problem, and that dwarf coconuts may require a perceptibly higher water table than do the tall palms.

As a general rule coconuts in Malaya are not manured, but during the year increasing attention has been given to this question and a series of experiments has been carried out on estates in conjunction with the Department of Agriculture to test the point. So far the results have been largely negative save that in one instance cultivation combined with green manuring has given rise to significant increase in yield.

Investigations in this direction are being continued.

During the year an investigation concerning the amount of plant food material removed annually in the process of cropping and in the fallen leaves and inflorescences was completed. The results indicate that these losses are considerable amounting in total on the average of Malayan conditions to

Nitrogen	...	67.0 lb.	per acre per annum
Phosphoric acid	...	28.0 lb.	do.
Potash	...	125.5 lb.	do.

The conclusion is reached that losses should be minimised by returning to the soil as large a proportion as possible of the actual constituents, but that even if all possible precautions are taken in the return of leaves, inflorescences, husks and shell, or the ash thereof, the application of artificial fertilisers may still be necessary if mature palms are to continue to yield good crops.

Statistics of yields and of sunshine and rainfall have been collected by the Department of Agriculture over a period of three years for six estates in Lower Perak, with a view to endeavouring to establish correlation between weather conditions and yields of nuts and copra. Although exact correlation is difficult it would appear that rainfall is the chief determining factor.

Heavy rainfall appears to exert its greatest influence on nut size from the second to the seventh month, while sunshine has the greatest effect in improving copra yield per nut, if it occurs from the seventh to the ninth month.

Great interest has been manifested on estates in the possibilities inherent in the improvement of the quality of copra produced.

Investigations have shown that the common faults of Malayan copra, *viz.* discoloration, moulds and insect attack are due in large part to defective drying systems and particularly to overloading of kilns. It has been shown that by careful attention to matters in these respects no difficulty exists in producing copra equal in appearance to the Ceylon No. 1 grade. It has also been found that the kiln which is cheapest and easiest to construct and operate is the Ceylon type of smoke kiln and that, bearing in mind the costs of operation and construction, the more elaborate and expensive types of driers offer few, if any, advantages. Certain modifications in kiln construction have been introduced and tried out on a number of estates and there is a definite trend in consequence towards the production of copra of superior grade.

So far these efforts have been without perceptible effect on the market prices; on the other hand it has been established that greater attention to quality tends to minimise losses in transit to an appreciable extent and hence will repay the labour expended on its performance.

During the year information has been obtained concerning moulds attacking copra under Malayan conditions and a number of moulds have been identified, chief among which are species of Aspergillus and these are found to be associated with certain bacteria.

Conditions on Small-Holdings.

Considerable progress has to be recorded in the matter of copra production by small growers as opposed to the long established practice of selling nuts to middlemen, copra makers and dealers.

Following the success of the early efforts in Kuala Selangor district, and in response to propaganda by the Department, development proceeded rapidly until the preparation of their own copra by growers has become an established practice through the whole of the coconut areas of the Selangor coast.

This radical change in procedure has resulted in substantially increased local prices for both nuts and copra, so that the grower has obtained considerably increased profits therefrom as set forth in the following table, the prices given being in Straits dollars and cents per picul of copra or equivalent.

TABLE VI.

Period	Nut price expressed as copra equivalent	Average price for Malay produced copra	Average price Singapore mixed	Discount below Singapore	
				On price of Nuts	On copra
	$	$	$	$	$
1930: June to December ...	3.00	4.00	6.35	3.35	2.35
1931: Whole Year ...	2.50	3.50	4.72	2.22	1.22
1932: January to June ...	3.75	4.43	5.15	1.40	.72
1932: June to December ...	4.05	4.52	5.16	1.11	.64

The advance in prices is due not only to increased competition but represents an effort on the part of dealers to arrest the tendency for growers to make their own copra and the position cannot yet be considered stable. Consequently, prices offered are often higher than are justified economically and, furthermore, apply to poorly made copra as well as nuts. In these circumstances low grade copra obtains a higher price than is justified by its quality, and the difference in price between this and the high grade product is much less than is warranted by the difference in quality. The outcome of this unhealthy position is that the betterment in quality of copra has not made such progress as is desirable. Progress in this respect is of considerable importance, as badly made copra is a spoiled product that cannot be turned into a high quality article by further treatment. On the other hand, a large number of recently erected growers' kilns have regularly turned out well prepared copra of estate quality and twelve of the kilns have produced copra equal to the Ceylon standard.

Arrangements have been made for periodic examination of copra prepared on kilns of approved pattern erected by growers, both in Selangor and in other parts of Malaya, so that a regular check is kept upon the quality of the product.

The start made in Selangor has been followed by similar developments in other parts of Malaya. Several of the approved pattern kilns have been erected in Province Wellesley and have produced copra of first grade quality. In the large copra area on the coast of Perak at Bagan Datoh, over 300 kilns have been erected by growers. Only a small proportion of these satisfy the Agricultural Department's standard and most of them are incapable of producing high grade copra owing to faults in construction.

The position in Johore is very similar, there being a large number of kilns only a small proportion of which are capable of producing high grade copra.

Present efforts are therefore directed towards effecting improvements in this respect and a Malay Officer, who has been trained for these special duties, has been detailed to supervise the erection of suitable kilns and to give advice on copra preparation.

Up to the present it has been possible to make arrangements for the sale of such high grade copra as has been produced at a price approximating to its true worth on ruling market prices. In Kuala Selangor district, when the first properly designed kiln began production, the difficulty was met by an arrangement with a local oil mill and the product recently made in Province Wellesley was disposed of to a Penang firm. As the movement develops, however, some definite market organisation will be necessary if the high grade product is to obtain the premium over the low grade article that its quality justifies and unless this premium is obtained there is bound to be a falling off in quality.

This matter is receiving careful attention at the moment.

Another aspect of the problem that has received recent consideration is the question of the registration of each group of growers concerned in the joint ownership and management of a kiln under regulations in a form most suitable to their requirements. It has become evident that some provision is necessary at an early stage in order that the growers concerned can operate and conduct business as a corporate body.

Pests of Coconuts.

Control of the coconut beetle (*Oryctes rhinoceros*) was efficiently maintained in all parts and calls for no special comment.

The caterpillar of the Zygaenid moth, *Artona catoxantha,* caused damage of varying extent to palms in Province Wellesley, in Krian and Kinta districts of Perak, in Selangor and in Singapore. The most serious attack was in Province Wellesley where damage has persisted since June and the pest is still in evidence at the end of the year. In Selangor, approximately 80 acres on an estate sustained damage in April, but the pest quickly disappeared as the results of heavy parasitisation. Elsewhere, attacks were slight and of very minor importance.

MANURIAL EXPERIMENTS WITH GUINEA GRASS AT SERDANG.

BY

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Introductory.

Owing to the scarcity of natural pasture in Malaya, and the consequent necessity for cultivating fodders required for feeding stock, experiments with different grasses have been commenced at the Government Experimental Plantation, Serdang, with the objects of ascertaining both the optimum interval between cutting and the manurial treatment, which will furnish the maximum yield of a grass containing adequate proportions of digestible nutrients and minerals.

Guinea grass, *Panicum maximum,* has been chosen for the first series of experiments, principally because this grass is relished by cattle and is also of good nutrient value. Later, it is hoped to extend the work to Napier grass, *Pennisetum purpureum,* and Dallis grass, *Paspalum dilatatum.*

Although the guinea grass has only been growing for 15 months, and yields are only available over a period of 6 months, it is considered that the results to-date are of sufficient interest to warrant publication.

Apart from the description of the original lay-out of the experiment, the present article must be regarded more in the nature of a progress report, since it is probable that, as a result of the combined effects of seasonal variations, manurial treatments and increasing age of the grass, some of the present conclusions may have to be modified.

Selection of Land.

Although previous trials with guinea grass at Serdang have shown that high yields of grass, 40 tons per acre per annum, can be obtained on freshly-opened jungle land, in the case of the present experiments, care was taken to select land which had previously been cultivated with other crops, thereby ensuring that the effect of a particular manurial treatment would not be masked by a high natural fertility factor.

Two types of soil were chosen for the experiment, a heavy soil in which the sand fractions varied from 14 to 44 per cent., and a light soil, in which the same fractions varied from 40 to 60 per cent.

As regards previous cultivation, the heavy soil had been planted with croton, *Croton Tiglium,* while in the case of the light soil the land was planted originally with limes, *Citrus medica* var. *acida,* but had latterly been allowed to develop into rough grazing.

In the case of the heavy soil, the land selected is on a slight slope, but the light soil area is flat.

Lay-out of Experimental Plots.

Since the experiment is designed to ascertain both the optimum interval between cutting and the most economical manurial treatment it is considered advisable to discuss these two points before describing the arrangement of the individual plots.

As regards the interval between cutting, it was decided in the first instance to commence recording yields after one week, two weeks and three weeks growth respectively. As will be seen later, the weekly system of cutting proved too exhausting for the grass, and a monthly interval was substituted.

The details of the different manurial treatments are given in Table I.

As will be seen, the treatments were chosen in order to provide a direct comparison between the effects of acidic and basic manures as regards the two types of soil chosen for the experiment.

Further, it will be noticed that for the first year a standard rate of application of phosphoric acid, 120 lbs. per acre, has been maintained throughout the scheme, and no separate application of a nitrogenous manure was included. In view of the long-term nature of the experiment and the low phosphoric acid content of Malayan soils, it was considered preferable for the first year to base the manurial programme on a phosphatic treatment, introducing separate nitrogenous manures at a later date, when the grass had become more established.

In view of the eight manurial treatments and the advisability of replicating each treatment in order to ensure a higher degree of accuracy for the yields, four series of eight plots were laid out in the form of a square, each plot being 1/20 acre. Each plot was trisected along its greater length in order to provide the necessary sub-plots for the different intervals of cutting.

As regards the lay-out of the 1/20 acre plots, the system of controlled randomisation was employed, the final distribution being as shown in Diagram I. A similar arrangement was adopted in the case of both areas.

TABLE I.

Manurial Treatments for Guinea Grass at Serdang.

Serial No.	Details of Manure	Rate of Application lbs. per acre per annum*
1	Basic Slag	750 (120 lbs. P_2O_5)
2	Superphosphate of Lime	750 (120 lbs. P_2O_5)
3	Calcium Cyanamide Basic Slag	210 (40 lbs. N) 750 (120 lbs. P_2O_5)
4	Ammonium Sulphate Superphosphate of Lime	200 (40 lbs. N) 750 (120 lbs. P_2O_5)
5	Calcium Cyanamide Basic Slag Sulphate of Potash	210 (40 lbs. N) 750 (120 lbs. P_2O_5) 167 (80 lbs. K_2O)
6	Ammonium Sulphate Superphosphate of Lime Sulphate of Potash	200 (40 lbs. N) 750 (120 lbs. P_2O_5) 167 (80 lbs. K_2O)
7	Cattle Manure	(67 lbs. N) 10,000 (120 lbs. P_2O_5) (32 lbs. K_2O)
8	Control	No manure

* The approximate amount of Nitrogen (N), Phosphoric acid (P_2O_5) and Potash (K_2O) corresponding to the different amounts of fertilisers are shown in brackets.

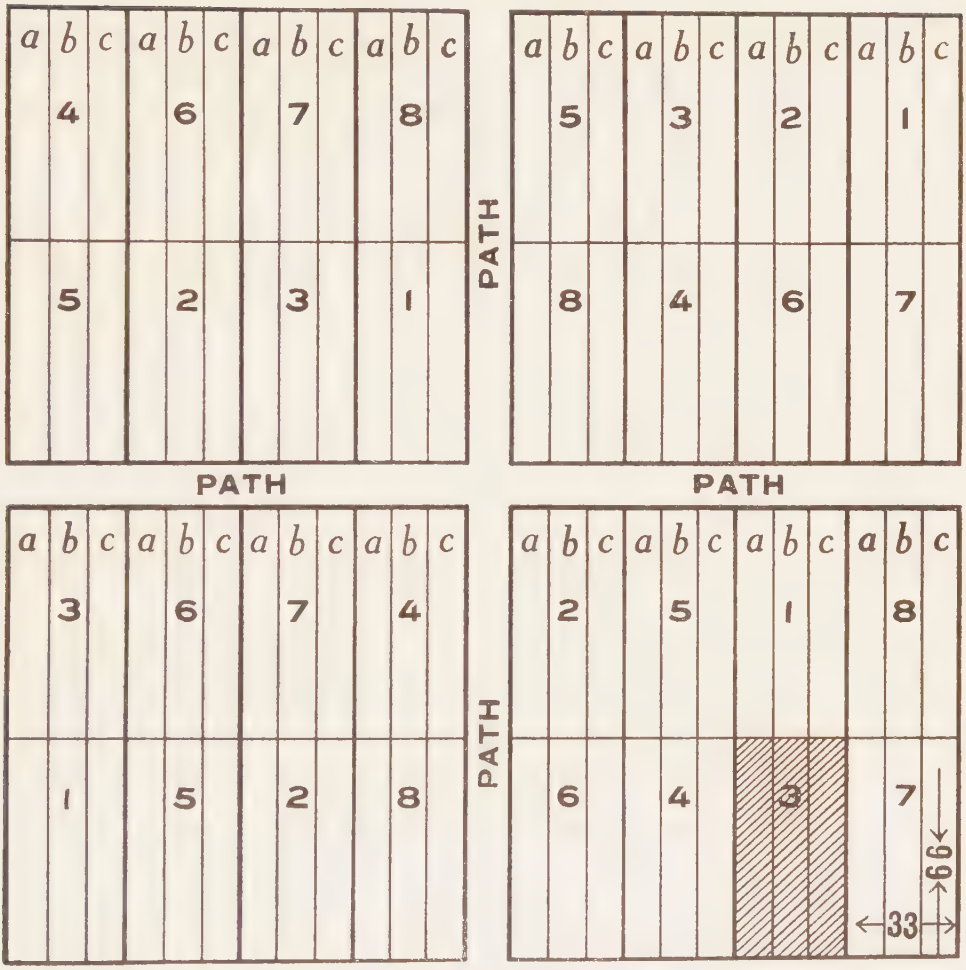
Since each variation in cutting and manurial treatment is quadruplicated, it can be calculated that the results are based on yields from areas of 1/15 acre, containing approximately 640 plants.

Planting and Cultivation.

The areas selected were enclosed with wire fencing and ploughed to a depth of 6 inches. Later, the ground was lightly cultivated and levelled in order to obtain an even surface for planting.

DIAGRAM I.

Arrangement of Plots in Manurial Experiments with Guinea Grass.



Notes: 1. The numbers of the plots correspond to the different manurial treatments.

2. The area of each plot, for example No. 3 shaded, amounts to 1/20 acre, the area of each sub-plot, for example No. 3a, No. 3b, No. 3c, amounts to 1/60 acre. The dimensions of each plot, *e.g.* No. 7, are 66 ft. x 33 ft.

3. (i) Sub-plots marked "a" were originally cut weekly, later monthly.
   (ii) Sub-plots marked "b" were cut fortnightly.
   (iii) Sub-plots marked "c" were cut three-weekly.

4. The details of the cutting periods are as follows:—
   First cutting period: December 1932 — January 1933.
   Second cutting period: January 1933 — March 1933.
   Third cutting period: March 1933 — May 1933.

Both areas were planted in March 1932, the stools of grass being spaced at intervals of 2 ft. x 2 ft., square planting.

In order to confine the manurial dressing applied to an individual plot the following precautions were taken:

Heavy Soil. Owing to the land being on a slight slope, silt pits, 1 foot wide and 1 foot deep, were dug along the length of the series of plots, No. 8, No. 1, No. 4 and No. 8, bordering on the upper edge of the main path running through the area. No silt pit was dug, however, on the other side of the path, its place being taken by a guard row. (See Diagram I).

The soil from the silt pits is thrown back periodically on the slope above the row of pits.

Light Soil. In view of the flat nature of the area, silt pits were considered unnecessary, guard rows running lengthwise between each series of plots being substituted in all cases.

The manurial dressings were applied between 4 and 5 months after planting, the cattle manure in July 1932 and the artificial fertilisers in August 1932. The soil was lightly forked, when the manures were applied.

After manuring, the plots received no further treatment beyond periodical weeding.

Cutting and Sampling of Grass.

As explained previously, the 1/20 acre plots were trisected in order to provide three sub-plots corresponding to the three intervals of cutting.

Cutting was commenced in December 1932, and has continued according to the programme as indicated below Diagram I.

As regards the method of cutting, individual stools are cut with a pruning-knife.

The weights of fresh grass for the different replications are recorded and the results summarised for each manurial treatmtnt.

At the expiration of the first six weeks of cutting the total yields for the period were summarised, a similar procedure being followed at the end of a further six weeks.

Since it was found that the weekly system of cutting had proved too exhausting for the grass, a monthly system was substituted, the period of summation for yields being accordingly lengthened to two months.

The procedure for drawing the sample for analysis is as follows: Commencing from one of the four corners of the sub-plot and looking lengthwise along the sub-plot, any stool of grass in the first six of the outside row is selected, the grass being cut and set aside.

The next stool for cutting is found by moving along to the next row and taking the sixth stool farther along the row, counting from the stool adjacent to that which has already been cut.

A similar procedure is followed, until eventually the last stool is taken from the corner diagonally opposite to that in which cutting was commenced.

An example will make the method clear. Assuming that stool No. 3 in the outside row has been selected as the starting-point of the cutting, the succeeding stools will be No. 9 in the second row, No. 15 in the third row, No. 21 in the fourth row and so forth.

The bulked samples of grass from the four replications for each of the eight manurial treatments on the two types of soil, 16 samples in all, are despatched without delay to the laboratory for analysis.

Yields of Grass.

Although the yields have been summarised for three individual periods, only average figures for the whole period of cutting to-date will be included in the present paper. It is thought preferable to defer publication of the yields for individual periods, until records covering a wider range of seasonal variations are available.

The figures for the average yields of grass, calculated in pounds per acre per week for the different intervals of cutting, are accordingly shown in Table II.

As explained previously, in the case of the fortnightly and three-weekly intervals the figures are based on the yields for the whole of the 6 months during which records have been taken. The figures for the weekly intervals only cover the first 3½ months of this period, those for the monthly intervals covering the remaining 2 months.

Excluding the figures for the weekly cuts in view of the discontinuance of this interval of cutting on account of the weakening effect on the grass and those for the monthly cuts on account of the comparatively short period during which this system has been followed, it will be noticed that the range of figures for the three-weekly cuts on both types of soil is higher than that for the fortnightly cuts.

Apart from the question of interval between cutting, there are other factors which affect yield. Among these may be mentioned (*a*) Soil, (*b*) Rainfall and (c) Manurial treatment. It is proposed therefore to consider briefly each of these factors in regard to the yields obtained to-date.

(*a*) *Soil.* The results indicate that the yields on the heavy type of soil are consistently greater than those for the light type of soil.

(*b*) *Rainfall.* So far, except for a short interval during February, the rainfall has been too evenly distributed to enable any definite conclusions to be

TABLE II.

Average Yields of Guinea Grass at Serdang, December 1932 - May 1933.

(Results calculated in lbs. of grass per acre per week).

Manurial Treatment		Weekly Cutting		Fortnightly Cutting		Three-Weekly Cutting		Monthly Cutting	
Serial No.	Details	Heavy Soil lbs.	Light Soil lbs.	Heavy Soil lbs.	Light Soil lbs.	Heavy Soil lbs.	Light Soil lbs.	Heavy Soil lbs.	Light Soil lbs.
1	Basic Slag	439	340	752	421	824	477	593	349
2	Superphosphate of Lime	266	329	422	403	535	438	349	371
3	Calcium Cyanamide Basic Slag	477	374	691	445	765	525	578	334
4	Ammonium Sulphate Superphosphate of Lime	398	266	651	379	756	415	496	344
5	Calcium Cyanamide Basic Slag Sulphate of Potash	493	390	758	472	814	533	593	498
6	Ammonium Sulphate Superphosphate of Lime Sulphate of Potash	405	388	723	497	866	572	604	496
7	Cattle Manure	405	310	633	434	706	441	397	320
8	Control	274	219	439	288	532	329	303	229

Note: To convert pounds of grass per acre per week to tons of grass per acre per annum the above figures should be divided by 43, *e.g.* 439 lbs. per acre per week = 10.2 tons per acre per annum.

drawn regarding the effect of this factor on yield combined with interval of cutting.

The figures covering the short dry spell in February indicate, however, that under such conditions and with heavy soil there is a tendency for the yield of grass, when cut fortnightly, to exceed that cut at three-weekly intervals.

(*c*) *Manurial Treatment.* The results of the various manurial treatments may be summarised as follows;—

(i) The maximum yields with both heavy and light soils are obtained as a result of the complete acidic mixture (ammonium sulphate, superphosphate of lime and sulphate of potash). Yields of 866 lbs. and 572 lbs. of grass per acre per week are equivalent to 20.1 tons and 13.3 tons of grass per acre per annum respectively.

(ii) As far as can be ascertained the application of a complete mixture (nitrogen, phosphoric acid and potash) to the light soil only raises the yield of grass to a figure of the same order as that found for the control plot on the heavy type of soil.

(iii) The application of all manures, with the exception of superphosphate of lime *per se* on heavy soil, has effected considerable increases of yield compared with the controls.

(iv) Cattle manure would appear to be less effective than artificial fertilisers.

(v) The effect on the yield of the addition of basic slag to the heavy soil is most marked.

(vi) It is difficult to explain the apparent lack of response to nitrogenous fertilisers. It is possible that this may be due to depletion before yields were recorded. This point will be referred to later.

Analytical Procedure.

The analysis of the grass comprised determinations of (*a*) moisture, (*b*) crude protein, (*c*) crude fibre, (*d*) ash, (*e*) lime and (*f*) phosphoric acid.

In view of the low oil content of the fresh grass, 0.4 per cent. or less, and the relative unimportance of the oil as regards composition, it was considered unnecesary to carry out routine analyses in respect of this constituent.

Further, owing to the large number of samples of grass, and the impossibility of carrying out individual analyses, it was decided to confine the work to a determination of the average composition of the grass during each cutting period. Analyses were therefore restricted to the determinations of the above constituents in average samples drawn from the bulk samples of grass collected during a particular cutting period.

The following procedure was therefore adopted. Each bulked sample of grass is weighed on arrival and quartered until approximately 200 grammes remain. This quantity is finely chopped, after which samples are drawn for determinations of (*a*) moisture, (*b*) crude protein.

(*a*) *Moisture.* 50 grammes are dried for 24 hours in an electric oven heated to a temperature of 65°—70°C. The sample is allowed to cool, and the loss in weight recorded. The oven-dried grass is retained until the expiration of the cutting period, being mixed from time to time with the other samples collected from the same plot.

Although with the above method an absolute figure for the moisture content is not obtained, the period of drying is sufficient to ensure an air-dry sample, which will not deteriorate during the period of storage.

Determinations of the moisture content of the air-dry grass on the conclusion of the period of storage showed that the figure approximated to 13 per cent. When weighing samples for analysis therefore an allowance was made on the above basis, for example, in those cases in which 5 grammes of the moisture-free grass were required 5.75 grammes of the air-dry grass were weighed.

As regards the absolute moisture content of the grass, the results of analysis showed that there was no significant difference between the figures for grass cut at intervals of two and three weeks respectively, the average figure approximating to 79 per cent. The latter figure has accordingly been adopted as standard in the present investigation.

(*b*) *Crude Protein.* 5 grammes of the fresh grass are digested with 25 c.c. concentrated sulphuric acid, also small amounts of potassium sulphate and copper sulphate, until a clear liquid remains. The latter is diluted with water and the solution made up to 250 c.c. An aliquot portion, 50 c.c., is withdrawn and placed in a bottle, to which similar aliquot portions from the corresponding samples of grass for the same manurial treatment for the remainder of the cutting period are added.

As regards the actual determinations of constituents on the bulked samples the following brief account may be of interest.

(*a*) *Moisture.* Determination as described above.

(*b*) *Crude Protein.* An aliquot portion of the bulked solution, corresponding to 2 grammes of the fresh grass, is made alkaline with caustic soda and the ammonia distilled into standard acid, the excess of which is determined by titration with standard alkali. The percentage of crude protein is obtained by multiplying the percentage of nitrogen by the factor 6.25.

(*c*) *Crude Fibre.* 1.15 grammes of the air-dry grass (1 gramme of moisture-free grass) are boiled for half-an-hour with 75 c.c. of 70 per cent. acetic acid, 5 c.c. of concentrated nitric acid and 2 grammes of trichloracetic acid under a reflux condenser. The liquid is diluted with water and filtered through muslin. The residue is washed with hot water until free from acid, then with small amounts of alcohol and ether, and dried to constant weight in the steam-oven. The residue is ignited and weighed, the loss in weight being calculated as crude fibre.

(*d*) *Ash.* 5.75 grammes of the air-dry grass (5 grammes of the moisture-free grass) are ignited in an electric muffle at a temperature not exceeding 600°C., until a clean white ash is obtained. The ash is treated with hydrochloric acid and, after removal of the silica, the solution is made up to 100 c.c., aliquot portions being taken for the determination of lime and of phosphoric acid.

(*e*) *Lime.* Calcium is precipitated as calcium oxalate from the acid solution by the appropriate method. The calcium oxalate is filtered off, treated with dilute sulphuric acid and the oxalic acid titrated with standard potassium permanganate.

(*f*) *Phosphoric Acid.* The phosphoric acid is precipitated as ammonium phospho-molybdate from the acid solution by the appropriate method. The yellow ammonium phospho-molybdate precipitate is filtered off, treated with an excess of standard potassium hydroxide, and the excess of standard alkali titrated with standard acid.

Composition of Grass.

Although the figures for the average composition of the grass covering three periods of cutting are available it is not proposed to tabulate the results in the present paper. At this early stage of the experiment it is thought sufficient merely to summarise the results of the determinations to-date, deferring publication of the detailed results to a later stage of the work, when records covering a wider range of seasonal variations are available.

It is also proposed to restrict the observations offered to a consideration of the results obtained with the fortnightly and three-weekly cutting periods only, those for the weekly and monthly cutting periods being excluded for the reasons given when discussing the yields.

(*a*) *Moisture.* The moisture content of the grass calls for little comment, the average figure of the fresh material being approximately 79 per cent. There were no marked differences between the figures for the grass cut at varying intervals.

(*b*) *Crude Protein.* The results to-date indicate that manurial treatment has little effect, if any, in causing a significant increase in the crude protein content of the grass, whether cultivated on heavy or light soil.

As regards the combined effects of soil and variation in period of cutting the results in the following table, Table III, which show the average figures for the three cutting periods, may be of interest.

TABLE III.

Variations in Crude Protein Content of Guinea Grass.

(Moisture-free basis).

Type of Soil	Fortnightly Cutting			Three-Weekly Cutting		
	First Period per cent.	Second Period per cent.	Third Period per cent.	First Period per cent.	Second Period per cent.	Third Period per cent.
Heavy Soil ...	17.3	15.6	14.4	17.1	14.7	12.7
Light Soil ...	17.9	15.2	13.6	12.9	12.5	12.0

The following general conclusions can be drawn :—

(i) While in the case of the fortnightly cutting on both types of soil, and of the three-weekly cutting on heavy soil, the figures for the crude protein content are originally of the same order, there is a marked decrease with increasing age of grass, especially in the case of the grass on heavy soil cut at three-weekly intervals.

(ii) Although the crude protein content of the grass on light soil cut at three-weekly intervals is originally much lower, there is no correspondingly marked decrease in this respect with increasing age of grass.

(iii) Considering the figures for grass cut at intervals of three weeks (the period which consistently gave the highest yields) the results show that in a period of six months on the heavy soil there is a reduction of over 25 per cent. in the crude protein content of the grass, compared with a reduction of only 8 per cent. in the case of the grass on the light soil taken over the same period.

As regards the relatively low figure for the crude protein content of the grass on light soil cut at three-weekly intervals, it is interesting to note that by increasing the cutting period to one month there is a further decrease in the crude protein content.

This decrease occurs on both types of soil as the figures for the third cutting period, which are given in the following table, Table IV, show.

TABLE IV.

Decrease in Crude Protein Content of Guinea Grass with Increasing Intervals of Cutting (Third Cutting Period.)

(Moisture-free basis).

Type of Soil	Fortnightly Cutting per cent.	Three-Weekly Cutting per cent.	Monthly Cutting per cent.
Heavy Soil ...	14.4	12.7	11.5
Light Soil ...	13.6	12.0	10.4

(*c*) *Crude Fibre.* The results of analysis indicate that neither manurial treatment nor interval of cutting has any significant effect on the crude fibre content of the grass.

As regards the type of soil, the results show that grass grown on heavy soil has a slightly lower crude fibre content than that on light soil, as the figures in the following table, Table V, show.

TABLE V.

Variations in Crude Fibre Content of Guinea Grass.

(Moisture-free basis).

Type of Soil	Fortnightly Cutting			Three-Weekly Cutting		
	First Period per cent.	Second Period per cent.	Third Period per cent.	First Period per cent.	Second Period per cent.	Third Period per cent.
Heavy Soil ...	27.2	28.3	26.3	29.6	27.0	28.1
Light Soil ...	30.0	29.1	27.7	30.6	29.3	29.5

(*d*) *Ash.* As would be expected, the ash contained varying amounts of soil particles, with which the grass had become contaminated, and the figure for the ash content is therefore of little significance.

As regards soil contamination, the results of determinations showed that this was greatest in the case of grass cut at weekly intervals, when the blades of grass were short and therefore close to the ground.

(*e*) *Lime.* The following table, Table VI, summarises the results as regards the lime content of the grass, in relation to the different manurial treatments and the varying intervals between cutting.

In view of the fact that the increases in the lime content, except in the case of treatment with cattle manure, have been maintained and that the results have shown such a small range of variation for the different treatments throughout the whole of the experiment to-date, only the average figures for the three cutting periods will be given. As regards the cattle manure the results showed that, while there was a slight increase for the first cutting period, the increase was not maintained.

TABLE VI.

Variations in Lime Content of Guinea Grass.

(Moisture-free basis).

Serial No.	Manurial Treatment	Fortnightly Cutting		Three-Weekly Cutting	
		Heavy Soil per cent	Light Soil per cent.	Heavy Soil per cent.	Light Soil per cent.
1	Basic Slag ...	0.68	0.95	0.59	0.94
2	Superphosphate of Lime ...	0.20	0.68	0.17	0.74
3	Calcium Cyanamide Basic Slag ...	0.69	1.07	0.76	1.02
4	Ammonium Sulphate Superphosphate of Lime ...	0.43	0.64	0.45	0.64
5	Calcium Cyanamide Basic Slag Sulphate of Potash ...	0.61	1.00	0.66	0.97
6	Ammonium Sulphate Superphosphate of Lime Sulphate of Potash ...	0.43	0.57	0.45	0.52
7	Cattle Manure ...	0.33	0.29	0.32	0.26
8	Control ...	0.30	0.28	0.29	0.23

The figures in the above table indicate that :

(i) While the lime contents of the grass on the control plots of both heavy and light soil are of the same order, 0.30 per cent., calculated on a moisture-free basis, the effect of similar manurial treatment is much more marked in the case of the light than the heavy soil.

(ii) On both types of soil, basic manures produce a greater increase than acidic manures.

(iii) The addition of superphosphate of lime alone to the heavy soil has a depressing effect.

(iv) The lime content of the grass is not affected by an increase in the interval of cutting.

(*f*) *Phosphoric Acid.* The following table, Table VII, summarises the results obtained to-date as regards the phosphoric acid content of the grass in relation to the different manurial treatments and the varying intervals between cutting.

In view of the fact that there was no tendency for the phosphoric acid content of the grass to diminish with increasing age of grass, only the average figures for the three cutting periods will be given.

TABLE VII.

Variations in Phosphoric Acid Content of Guinea Grass.

(Moisture-free basis).

Serial No.	Manurial Treatment	Fortnightly Cutting		Three-Weekly Cutting	
		Heavy Soil per cent	Light Soil per cent.	Heavy Soil per cent.	Light Soil per cent.
1	Basic Slag ...	0.52	0.88	0.44	0.79
2	Superphosphate of Lime ...	0.29	0.85	0.28	0.83
3	Calcium Cyanamide Basic Slag ...	0.50	0.79	0.48	0.73
4	Ammonium Sulphate Superphosphate of Lime ...	0.45	0.79	0.43	0.76
5	Calcium Cyanamide Basic Slag Sulphate of Potash ...	0.50	0.84	0.46	0.75
6	Ammonium Sulphate Superphosphate of Lime Sulphate of Potash ...	0.46	0.75	0.43	0.67
7	Cattle Manure ...	0.42	0.44	0.39	0.42
8	Control ...	0.32	0.37	0.29	0.31

The following conclusions may therefore be drawn :

(i) While the figures for the phosphoric acid contents of the grass on the control plots are of the same order in both cases, 0.30 per cent., calculated on a moisture-free basis, the effect of similar manurial treatment is much more marked in the case of the light than the heavy soil.

(ii) All manurial treatments, with the exception of superphosphate of lime on heavy soil and cattle manure on light soil, effected increases of a similar order. The depressing effect of the addition of superphosphate of lime *per se* to the heavy soil is again most noticeable.

(iii) The figures indicate a tendency for the phosphoric acid content of the grass to diminish with an increase in the interval of cutting.

Remarks and Conclusions.

Although, as stated previously, figures for both yields and composition cover only a period of six months, it is considered that there is sufficient information available to enable certain general conclusions to be drawn. These may be summarised as follows :—

(*a*) *Yield* :

(i) The yields of grass on heavy soil are greater than those on light soil.

(ii) The three-weekly interval of cutting gives the highest yield of grass.

(iii) All manurial treatments, with the exception of superphosphate of lime *per se* on heavy soil, effected marked increases in yield. Cattle manure was, however, less effective than artificial fertilisers.

(iv) Combining soil, yield and manurial treatment the figures indicate that the most satisfactory results to-date from an economical point of view have been obtained with grass grown on the heavy soil, manured with basic slag.

(*b*) *Composition* :

(i) The grass on light soil responded better to manurial treatment than that on heavy soil, particularly as regards an increase in both the lime and phosphoric acid contents.

(ii) Similarly to yield, a depressing effect, as regards both lime and phosphoric acid contents, was obtained with superphosphate of lime *per se* on heavy soil.

(iii) Manurial treatments had little or no effect as regards raising the crude protein content of the grass.

(iv) With increasing age there was a marked decrease in the crude protein content of the grass on heavy soil, cut at three-weekly intervals.

(*c*) *Yield and Composition* :

(i) Joint consideration of yield and composition shows that basic manures are probably superior to acidic manures, while both are definitely superior to cattle manure as applied under the conditions of the experiment.

(ii) An interesting feature of the results is the apparent lack of response obtained with nitrogenous and potassic manures when applied in conjunction with phosphatic manures.

As regards the lack of response to nitrogenous manures which, as stated previously, may be due to their rapid depletion, arrangements have been made in the second year's programme of manuring to apply the nitrogenous dressing in three equal parts at intervals of four months. It is hoped thereby to obtain some information as regards this question of rate of depletion.

Acknowledgments.

The authors wish to acknowledge the help which they have received in the investigation from Inche Mohamed Ali bin Mohamed Said and Inche Mohamed Tahir bin Indin, Malay Agricultural Assistants, Grade II. Inche Mohamed Ali carried out the routine analyses, while Inche Mohamed Tahir was responsible for the field work at Serdang in connection with the cutting of the grass.

The authors also desire to thank Major C. D. V. Georgi, Acting Agricultural Chemist, for his assistance in the preparation of the article for publication.

THE PROGRESS OF COPRA PRODUCTION BY MALAY SMALL HOLDERS IN SELANGOR.

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Introduction.

In Volume XX, 1932 of the *Malayan Agricultural Journal* a short account was given of the results of efforts made by various Officers of the Department of Agriculture to improve the lot of the small-holders in the Kuala Selangor district of Selangor and generally to improve the quality of copra produced by such holders.

The methods employed were to encourage Malay owners of coconut holdings to prepare copra from their own nuts rather than to sell nuts to middlemen who prepared the copra; to encourage the use of an improved type of small kiln capable of producing copra of good quality in preference to the inefficient small kilns in common use; and to obtain where possible the direct sale of the copra to exporters in place of its transfer through one or more middlemen.

The first outcome of these efforts was the erection experimentally by two individual Malays of a brick and a clay-walled kiln respectively of a design approved by the Department of Agriculture.

The effect of these efforts as was expected, has had a very marked influence on copra production throughout the coastal districts of Selangor. The financial benefits derived by the owners of the two kilns concerned, especially the brick-walled one, soon became known, and in the space of a few months, enthusiastic Malays in all parts were erecting kilns and manufacturing their own copra. Since that time copra manufacture by the Malays has become an established industry in Selangor and is becoming so in many other parts of Malaya.

Final Results of Scheme I.

The Javanese owner of the brick kiln, proved to be extremely adaptable, and within a very short time mastered the advice given him. The quality of this man's produce steadily improved until he was turning out some of the best quality copra ever produced in Malaya, and equal to that regularly produced by estates in Ceylon. This improved quality, after the first vital difficulties of marketing were overcome, commanded prices equal to those enjoyed by the large

estates. Owing to his system of paying a bonus, the supply of nuts from his contributors steadily increased, and at the end of 1932 he had increased his production to such an extent that his old kiln was too small, and he found it necessary to enlarge it. This was effected by adding another two compartments, making one large kiln divided into four—whereupon he adopted a four-day drying process.

Final Results of Scheme II.

The Malay owner of the clay-walled kiln, although his kiln was of excellent workmanship, failed, owing to lack of business acumen, to produce such a high quality of copra as that from the brick kiln. Since he was unable to command top prices he suffered considerably from competition by the middlemen producers, and has therefore been of little use for propaganda purposes.

Attention was concentrated on a few of the more progressive Malays who had also erected clay walled kilns and who, within a short period, were able to produce the desired quality of copra.

Practical Difficulties Attending Construction of Clay-Walled Kilns.

As previously reported, the use of alluvial clay alone in construction of the kiln walls did not prove to be entirely satisfactory, owing to excessive shrinkage of the clay, resulting in the formation of large cracks. It was found, however, that if the walls were continually rammed and all large cracks filled with a mixture of equal parts of lime and sand, a lasting wall was obtained. A better method is the employment of a mixture composed of about 80 per cent. heavy clay, 10 per cent. sand and 10 per cent. lime, which is puddled together and well rammed to form the walls, and if this is further faced with a mixture of lime and sand, or cement, no cracking occurs and a wall, almost equal in strength to that of bricks, is obtained.

The use of clay mixtures as a building material has, however, not been very popular, owing to the amount of labour involved and it was soon found that those Malays who had capital available preferred to erect brick-walled kilns. Others with less money made their walls of planks, corrugated iron, bricks and clay, tiles and clay or such other materials. Planks and corrugated iron are not to be recommended owing to the danger of fire and the fact that the latter does not retain the heat sufficiently.

Effect of the Experiments.

(*a*) On Copra Production.

The most outstanding and direct result has been the large increase in the number of kilns owned by small-holders; thus whereas as in February, 1932, it was estimated that there were 120 kilns, all of which were in the Kuala Selangor

district, by March, 1933, there were approximately 403 kilns, distributed as below :—

District			*Kilns*
Sabak Bernam	...	...	161
Kuala Selangor	...	...	185
Klang	...	...	14
Kuala Langat	...	...	43
Total		...	403

Out of this total, 18 are of the improved type, 354 semi-improved and the others a vast improvement on the crude primitive kilns.

The copra produced from these kilns owing to inexperience was at first inferior to that produced by the middlemen producers, but as the owners gained practical experience and obtained assistance from the owners of the improved kilns, the quality slowly improved, and is now slightly better than that produced by the middlemen.

The owners of the improved kilns steadily improved the quality of their copra, and at the time of writing twelve of them are regularly producing copra equal to high-grade estate quality and low grade Ceylon, and thirty seven produce copra equal to average estate quality. At the present time small-holders produce approximately 7,750 piculs of copra a month or 30 per cent. of the total monthly crop from Selangor small holdings. Of this 7,750 piculs some 1,000 piculs are equal to or better than average estate quality.

One of the chief reasons for the slow improvement in quality has been the abnormal prices offered for inferior grades of copra.

(*b*) On Copra Prices.

As soon as the small-holders commenced copra manufacture in earnest, the middlemen producers at once advanced prices for nuts and later for copra, and, as more and more small-holder producers came into the market, the competition increased. This, together with severe competition between the middlemen themselves, has resulted in the payment of uneconomic prices, and the steady growth of a new sphere of activity on the part of the middlemen producers, namely the buying of wet copra from small-holders and re-drying for the dealers. The price paid for this wet copra has been extremely high and in many cases has actually made the production of dry copra less profitable. Coinciding with a rising market, high prices could safely be paid by the middlemen. Naturally under such conditions the majority of the small-holders preferred to sell their product in a half-finished state not realising the danger

of such a practice, and the serious handicap it has on effecting a general improvement in quality. When the market turned, however, the effect of the practice was at once apparent.

Furthermore, the price offered for good quality copra by the local dealers, was always below the true value, owing to the small quantity produced and the necessity of recovering some of their losses on the lower grades. This fact made it necessary to break with the usual marketing channels and to find alternative markets for these high grades.

(*c*) On Nut Prices.

As with copra prices, nut prices have also soared to limits never before reached. Towards the end of 1932, in certain areas where copra manufacture by small-holders was well advanced in strong middlemen producing areas. the prices paid for nuts was actually above the equivalent price for copra. It is interesting to note, however, that such attempts by middlemen to regain their old trade have generally failed, for, although in some areas many small-holders have abandoned copra production for nut sales, those with improved kilns have carried on and have kept the prices high, whilst others re-commenced copra manufacture as soon as nut prices dropped again. In other areas attempts on the part of the middlemen producers to regain their old trade have completely failed, as the small-holders have refused to sell their nuts.

Table VI in the preceeding article by Dr. H. A. Tempany, on "Coconuts and Copra in Malaya in 1932", shows the increased prices offered for copra and nuts during 1932 as compared with 1930 and 1931. The following Table gives some idea of the financial advantages which have accrued to the small-holders as a result of these experiments.

Period	Average return per acre per annum with a Fixed Singapore price of $5.00		Additional gross income	
	By nut sales	By copra manufacture	By nut sales	By copra manufacture
	$	$	$	$
1930 : June — December	23	31	—	—
1931 : Whole year	26	37	3	6
1932 : January — June	36	43	13	12
1932 : July — December	39	44	16	13

The above Table is based on the assumption of an average yield of 10 piculs of copra = 2,500 nuts per acre per annum.

It will be noted from the figures given that, as a result of the change over from nut sales to copra manufacture, the income of the small-holders has been approximately doubled since 1930.

In the case of the Javanese mentioned in Scheme I who purchases an equal number of nuts from five neighbours at the current prices, his income has been trebled.

Methods of Marketing.

As has been previously mentioned, the fact that the local small dealers were not prepared to offer the true price for the high-grade copra produced from the improved kilns, made it necessary to find other buyers. The arrangement made by the District Officer, Kuala Selangor with one of the local Kuala Selangor towkays worked very well until competition became keener. As the towkay was forced to purchase a certain amount of low-grade copra to make up his consignments and had to pay high prices for these grades, he naturally was unable to pay top prices for the good grades. In March, 1932, a wealthy Malay seeing an opportunity of helping his own countrymen, set himself up as a buyer and offered a fair price for the produce from the Malay kilns. This buyer, although always offering high prices, often in excess of the true value for wet copra, would not give an adequate price for high-grade, dry copra and hence the Malays producing that quality were no better off.

As soon as a sufficient quantity of dry copra was being produced by small-holders it became possible to arrange sales direct between them and large dealers. The chief difficulty experienced was to obtain the necessary quantity of high grade copra. Bulking of the varied product from small individual producers was found to be undesirable and hence some form of joint manufacture was necessary.

Three methods of mutual assistance have been adopted :—

(*a*) Manufacture by an individual owner.

(*b*) Manufacture on a joint-owned kiln.

(*c*) Co-operative manufacture.

Manufacture by an Individual Owner.

This was the original scheme adopted by the Javanese owner of the brick-kiln in Kuala Selangor. In his case it has been extremely satisfactory as he has ensured loyalty from his nut suppliers by the payment of a bonus but, in other cases, where such bonus has not been given, the loyalty of the contributors has been very uncertain.

This method should only be recommended if the owner has sufficient capital to erect a proper kiln and to pay working expenses for at least a month. It is also essential that the owner should have business ability and initiative. Furthermore, the owner himself should have a sufficiently large holding to justify the erection of a kiln as full reliance on outside nut supplies is very undesirable.

Manufacture on Joint-Owned Kiln.

This method differs from the above in that two or more large owners or a number of small-holders join together to erect a kiln, all expenses and profits being proportionally shared out. If this method is to be a complete success it is necessary that one man should be placed in full charge of manufacture and receive some consideration for his trouble. Such organisations as these have not, so far, proved popular.

Co-operative Manufacture.

The following account taken from a memorandum by Mr. Newboult, formerly District Officer, Kuala Selangor, of the working of two co-operative copra kilns in that district is of particular interest as it shows that, with careful supervision and training, the coconut small-holders are able to combine successfully. The number of such endeavours are slowly increasing in the Kuala Selangor district of Selangor, but all require a considerable amount of care and attention if financial losses due to faults arising from inexperience are to be avoided.

It is interesting to note that endeavours in this direction have so far only been successful amongst the Javanese.

Co-operative Kilns — Sabak Bernam.

(*a*) Sidang Long's Kiln.

This kiln was started in September, 1931 by fourteen small-holders combining and paying $10 each. This was sufficient to build the kiln and also most of the shop adjacent which they regarded as an essential adjunct.

The main idea of the members was to rid themselves of unnecessary middlemen and to have a fund from which they could borrow for their general living expenses which hitherto had been done from the local shop. Each member sells his nuts to the kiln and is paid cash at the current market rate. Copra manufacture is done by coolies working under the direction of a manager who is also a member. The copra produced is sold direct to Penang and the money thus obtained goes into the kiln account, the members themselves not getting any direct profit from the drying of the copra.

Non-members may sell their nuts to the kiln and receive the same price as members do, but cannot borrow from the fund. At one time loans were tending to swamp the profits and a by-law had to be passed prohibiting members from borrowing more than $10 at a time. The loans are settled on the occasion of the next sale of nuts to the kiln.

At the end of 1932, the kiln which was formerly a semi-enclosed half clay, half plank walled one, was rebuilt with bricks and the kiln house enlarged. Both of these undertakings were done from profits.

The accounts are kept by a book-keeper, who receives a small monthly salary, and are checked by the committee.

A profit of approximately $490 was earned by this kiln during the period September 1931 to December 1932.

(*b*) To' Halus.

A similar Society to the one above was started about a mile away, during the latter part of 1932. The membership is smaller and owing to its inception at the time of keen competition, it has not met with the same success. The chief obstacle has been the absurdly high price prevailing for nuts, and the fact that members appear to be disinclined to accept slightly lower prices.

The kiln was not at first very satisfactory, being built of clay and planks without an enclosure, but at the beginning of 1933 this had been replaced by a brick-walled kiln and the society re-formed on a sounder basis.

Miscellaneous Articles.

THE SELANGOR BULK OIL INSTALLATION PLANT.

Introductory.

A further stage in the development of the Malayan oil palm industry was reached on August 22nd 1933 with the first shipment of oil in bulk from the Selangor Bulk Oil Installation Ltd., at Kampong Kuantan, Selangor by the Straits Steamship Co. m.v. "Rasa" to Singapore.

The Selangor Bulk Oil Installation Ltd. is a local Company formed for the purpose of transporting by sea to Singapore palm oil in bulk from certain estates in Selangor. On arrival at Singapore the oil is taken over by the Malayan Palm Oil Bulking Co. Ltd., the Service Company for Malaya, which arranges for its despatch by ocean-going steamers.

This development would not have been possible without the co-operation of the Straits Steamship Co. who constructed the motor-vessel "Rasa" specially for the coastal palm oil traffic to Singapore, since, in addition to the oil from Kampong Kuantan, the "Rasa" also conveys oil from certain estates situated on the Bernam River.

Messrs Cumberbatch & Co. Ltd. are the Secretaries and Agents for the Selangor Bulk Oil Installation Ltd.

Description of Plant

The installation at Kampong Kuantan has been erected on land leased from the Malayan Water Transport Co. Ltd., also a local Company, which engages in river and coastal transport of goods.

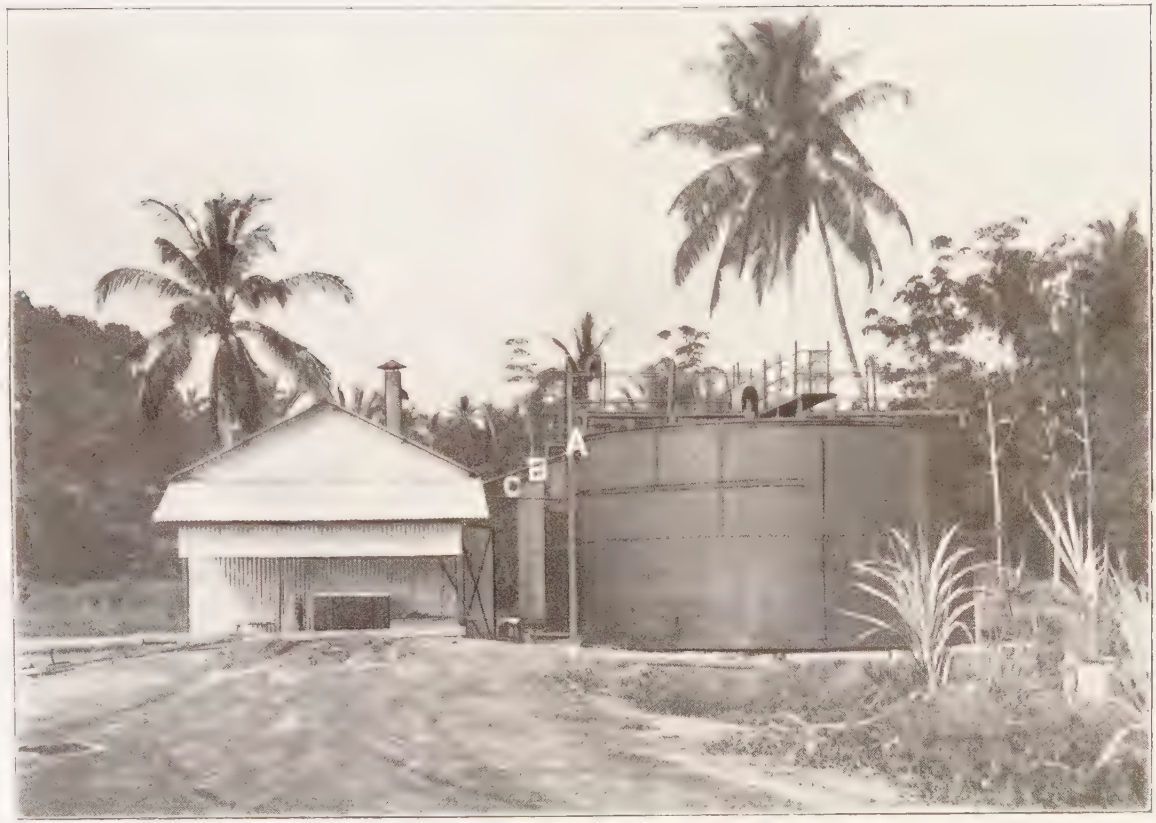
The plant comprises a small receiving tank for the oil, three 100 ton storage tanks, a boiler for the provision of steam to heat the oil, and a pumping installation and pipe-line for transferring the oil from the storage tanks to the ship.

Method of Working.

The oil is brought from the estates either by tank lorry or in drums. In the case of one or two small estates, which have river frontage, the drums are conveyed by barge to the installation.

The receiving tank is mounted on a weighbridge, so that all oil can be weighed on arrival before being pumped into one of the large storage tanks.

A small sample of oil is drawn from each charge of the receiving tank, the samples from various estates being bulked in separate bottles. Weekly determinations of acidity are carried out on the bulked samples of oil.



Installation for Bulk Shipment of Palm Oil.

Each storage tank is provided with a closed steam coil for heating the oil, the temperature being taken by means of thermometers set in pockets at different heights in the tank. Further, the pumping installation has been so arranged that it is possible either to circulate the oil in a tank, thereby ensuring that the oil is thoroughly mixed before being shipped, or to transfer oil from one tank to either of the other two tanks.

On the day prior to despatch, the oil is heated to a temperature of approximately 120°C. and circulated as described above.

At this temperature there is no longer any solid fraction present in the oil, and further the viscosity is reduced sufficiently to enable the oil to flow freely. As far as can be ascertained, the quality of the oil is unaffected by heating to this temperature.

The oil is then ready for delivering to the m.v. "Rasa". This vessel is provided with six tanks, the total capacity being approximately 220 tons of oil. Owing however to the difficulty of navigating the vessel with a full load in the Selangor river, not more than 150 — 160 tons of oil can be carried with safety.

The pump installed has a delivery capacity of approximately 50 tons per hour. If a more rapid rate is required, the pumps on the m.v. "Rasa" are also available.

General.

The bulked oil shipped from the Kampong Kuantan installation is of high quality as the following figures, giving the results of acidity determinations for average samples from the first two shipments, show :

	Acidity (calculated as palmitic acid) per cent.
Shipment No. 1 ...	2.3
Shipment No. 2 ...	2.9

In conclusion the writer would like to draw attention to the commendable spirit of co-operation shown in developing this scheme, the results of which cannot fail to be of benefit to all concerned, as well as to the industry in general.

C. D. V. G.

CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA.

3rd Quarter 1933.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S. in collaboration with the Field Branch of the Department of Agriculture.

Rainfall.

Reports from the various centres state that weather conditions throughout the country during July were normal, rainfall being fairly evenly distributed; in the Northern part of the Peninsula good rains were experienced and precipitation on the coast of Malacca and the Negri Sembilan showed the increase which generally occurs in July over this particular area; in North Perak, the Negri Sembilan and Pahang the rainfall was slightly in excess of the average for July.

In August on the Western side of the Peninsula the weather was on the whole normal, in the State of Perak and at Cameron Highlands, however, the rainfall was much above the average, and in the Larut and Matang districts of Perak the precipitation was practically double the recorded average; whilst in Malacca, more especially the coastal area, there was a drought.

The rainfall for the month of September was below average, the weather in general being hot and dry for the first three weeks with rain during the last week. Rainfall was evenly distributed in Kedah, showers being frequent, whilst on the coast of the Negri Sembilan and Malacca the rainfall was heavier than is usual during September; in Johore and Singapore the weather was hot and showery.

Prices.

Table I, which is appended, shows the ruling prices for the period, it will be seen that the price increased considerably compared with the previous quarter having reached the peak during July, in which month the average price was $16.91 per picul for Standard Sheet and ranged between $10 and $18.70 and went even as high as $20 per picul in two districts for the small-holders' product.

There was a slight decrease in price for all grades during August and September, the price per picul for the native product during the former month ranging between $10 and $18.50 per picul and during the latter month $10 to $16.

The quotations in the Table show the ruling prices from a large number of buying centres and it should be noted that such factors as transport and local competition, affect the prices secured by the small-holder for his rubber.

The following Table shows the trend of prices per picul at the end of each month, ruling in Singapore for Kampong rubber during the past 9 months of 1933.

	Smoked Sheet $	Unsmoked Sheet $	Scrap $
January	8.00	7.00	3.20
February	7.50	6.70	2.40
March	7.60	6.80	2.50
April	7.80	6.80	2.70
May	11.80	11.00	5.00
June	13.50	12.25	5.00
July	17.50	16.00	7.00
August	15.00	14.00	6.00
September	15.00	14.00	5.50

Tapping.

The considerable increase in price during the quarter has resulted in further enlargement of the areas tapped. As regards tapping methods employed, reports from throughout the Peninsula indicate that consequent on the rise in price the quality of tapping has deteriorated greatly, and furthermore the practice of tapping daily, several panels on one tree, became fairly common, while deep tapping and extensive wounding were also reported. The reports suggest that these conditions are more general on Malay-owned holdings leased to Chinese or tapped on the bagi-dua system.

Areas out of Tapping on Small Holdings.

The method of estimating the area untapped among small holdings by means of counting the number of such holdings along the sides of main roads was again employed, the result of this computation is shewn in Table II and was applied to the known area of tappable rubber, 1927 planting and earlier.

As a result of the rise in the market price of the commodity large numbers of small holdings have recommenced tapping and production has expanded in consequence.

The total area of tappable rubber on estates of less than 100 acres which was untapped in the Federated Malay States in September 1933 is estimated on the foregoing system as amounting to approximately 48,989 acres as compared with 133,000 acres in March and 56,355 acres in June of this year.

The total area untapped in the Straits Settlements in September is estimated to be 17,658 acres as compared with 49,000 in March and 27,742 acres in June of this year.

Diseases.

Mouldy-Rot.—Reports from all centres show that mouldy-rot is still very prevalent, the incidence of the disease having increased somewhat due to the weather conditions during the period under review.

Outbreaks have been rather severe in the Muar, Batu Pahat and Kota Tinggi districts of Johore and it is reported that measures for prevention or cure have not been extensively adopted in these districts. In Segamat and Kluang, painting of diseased trees was practised with satisfactory results.

In the State of Perak mouldy-rot is present in all areas but has not as yet done excessive damage to bark anywhere, efforts to popularise the use of disinfectants are being maintained.

Pink Disease.—Small outbreaks of this disease were recorded in several districts in Kedah. Effective control measures were carried out as soon as the disease was observed.

Root Disease.—A few cases of root disease have been reported in Johore and in all cases technical advice was given.

Oidium Leaf Disease.—The only outbreak reported was a slight one on a number of small holdings at Labis, Buloh Kasap and Kuala Paya in Johore during September.

Grades of Rubber Made.

Figures of the percentages of the various grades of rubber produced, where these have been recorded, are as follows:—

Perak: Kuala Kangsar:—(figures from 6 dealers) smoked sheet 38, unsmoked sheet 24, scrap 32, lump 6.
Larut and Matang:—(figures from 12 dealers) smoked sheet 8, unsmoked sheet 62, Scrap 28, lump 2.

Alor Star: (figures from 6 dealers) smoked sheet 74, unsmoked sheet 14, scrap 12.

Negri Sembilan: Rembau, Kuala Pilah and Jelebu:—(figures from 7 dealers) smoked sheet 21, unsmoked sheet 60, scrap 19.

Penang and Province Wellesley: (figures from 26 dealers) smoked sheet 12, unsmoked sheet 72, scrap 16.

Malacca: All districts (32 dealers): smoked sheet 29, unsmoked sheet 53, scrap 18.

TABLE I.

Rubber Prices in Straits dollars per picul (133⅓ lbs.)

3rd Quarter, 1933.

	Singapore standard sheet Average	Singapore for small holder's rubber at end of month	Penang for small holder's rubber	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Province Wellesley	Kedah	Johore
					JULY						
Smoked sheet.	16.91	17.50	—	10-18	13-19	11-19	12.30-18.70	15-20	16-20	12.20-16.50	12-18.50
Unsmoked sheet.		16	12-18.40	7-17	12-16	9-17.20	10-18	13-15	12-19	9.70-14	8-17
Scrap		7	5 15-7.50	1-6.50	2.50-6	2-7.50	3-7	3.50-6.50	4-8	3-7	2-7.50
					AUGUST						
Smoked sheet	16.25	15	—	11-15.50	13-17	10-17	11-18.50	14-18	12-16	12-19	10-18.50
Unsmoked sheet		14	13-15.50	10-12.60	11.50-15	8-15	10-17	10-13.50	11-14.50	11-16	8-16.50
Scrap		6	5.50-6.50	2-5	3-6	2-6	3-7	3-7	3-6.50	3-6.50	1.80-7
					SEPTEMBER						
Smoked sheet.	15.91	15	—	11-14.50	10.35-16	12-15.50	10.50-15	12-15	10-15	13-15	10-15
Unsmoked sheet.		14	11.50–13.50	9-13.50	11-15	9-13.25	8.50-14	10-13	9-14	10-13	7.50-13.80
Scrap		5.50	5.50-7.50	1.50–5	3-7	2-5.25	1.50-6.50	3-8	3-6	4-6	1.70-7

TABLE II.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of September, 1933.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	37,288	5,220	14	Klang	18,879	3,020	16	Seremban	19,241	2,501	13	Raub	7,361	147	2
Kinta	34,180	2,392	7	Kuala Langat	29,263	1,756	6	Tampin	17,947	2,333	13	Kuala Lipis	15,951	2,712	17
Kuala Kangsar	43,485	435	1	Ulu Langat	38,867	1,943	5	Kuala Pilah	17,470	4,891	28	Bentong	13,600	1,632	12
Upper Perak	13,774	1,652	12	Ulu Selangor	30,632	2,144		Jelebu	6,270	313	5	Other Districts	31,223	3,747	12
Larut & Selama	51,407	6,168	12	Kuala Lumpur	21,174	2,444†	8†	Port Dickson	10,653	1,598	15				
Krian	9,751	1,462	15	Kuala Selangor	9,379										
Lower Perak	47,937	479*	1*												
	237,822	17,808	8		148,194	11,307	8		71,581	11,636	16		68,135	8,238	12

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	17,687	3,714	21	North	3,241	292	9	Singapore	12,781	3,067	24
Alor Gajah	31,387	7,533	24	Central	7,067	636	9				
Jasin	24,97	50	2	South	8,149	163	2				
				Dindings	7,279	1,092	15				
				Penang	11,114	1,111	10				
	74,045	11,297	15		36,850	3,294	9		12,781	3,067	24

The percentage of areas out of tapping in June, 1933, was as follows:—Perak 10, Selangor 12, the Negri Sembilan 19, Pahang 20, Malacca 22, Penang and Province Wellesley 16, Singapore 45.

* Estimated from same percentage as shown in Kuala Kangsar District.

† Estimated from mean percentage for remainder of State.

TABLE III.

Estimated Production of Rubber by Estates of less than 100 Acres in Area during the Period January to September, 1933.

1933	F.M.S.	S.S.	U.M.S.	Total Malaya
January ...	8,180	2,199	5,727	16,106
February ...	6,232	1,592	4,979	12,803
March ...	7,441	1,948	5,447	14,836
April ...	7,271	1,749	5,876	14,896
May ...	9,331	2,245	6,825	18,401
June ...	10,192	2,536	6,274	19,002
July ...	11,065	2,577	8,143	21,785
August ...	10,111	2,893	6,714	19,718
September ...	9,807	2,893	6,775	19,475

Tendency to Abandon Rubber Cultivation for Alternatives.

Since the price of rubber has increased and remained fairly steady at the enhanced value, this tendency appears to have diminished.

General.

With the price of rubber remaining steady and showing a profit to the small-holder further considerable areas of temporarily abandoned mature rubber have been brought into tapping again during the quarter. The high price of the commodity during the month of July caused tapping to be commenced on a number of holdings on which it had been previously delayed in the State of Johore, this being particularly noticeable in the districts of Batu Pahat—Kluang, Senggarang, Muar and Segamat. Reports from Perak state that padi planting considerably reduced the incidence of tapping during the quarter, especially during the month of September.

It is stated that there has been a general marked improvement in sanitary conditions of small-holdings, slashing of blukar and rubber seedlings having taken place on many holdings.

DISTRICT AGRICULTURAL SHOWS.

(*a*) Ulu Langat District Show.

The second annual Ulu Langat District Agricultural Show was held at the Government Offices, Kajang on Sunday October 1st.

The show was formally opened by the Hon'ble the British Resident, Selangor in the presence of a number of Government Officials from the Agricultural and Co-operative Departments and a large gathering of local Malays. The Director of Agriculture, the Chief Field Officer and the Assistant Director of Co-operation were among those present.

There were eight competitive sections for padi, fruits, vegetables, minor economic crops, poultry and home industries. Most of these were well supported while the actual exhibits reached a fairly high standard. The best sections were those devoted to padi, vegetables grown by Chinese market-gardeners and poultry.

Besides the competitive classes, special exhibits were shown by the following :—

Yu Hwa School of Manual Arts. Various types of needle work, paintings, and pictures worked in silk etc.

8th. Troop of Boy Scouts. A model of a Scout camp and numerous black and white sketches of various natural objects.

Department of Agriculture. This exhibit aimed at illustrating methods of attacking the chief agricultural problems of the district connected with padi, rubber and poultry.

Under padi, specimens of the three most important pests, rats, stem-borers and *Leptocorisa* sp. were shown together with the damage they do to the padi plants and control measures to be adopted against them. Three pure strains of selected padis and their rices were exhibited, in conjunction with a small exhibit put up by the Kajang Rice Mill.

Under rubber—Mouldy Rot, its cause, effect and treatment was illustrated by actual specimens.

Poultry. A pair of cross-bred Kampong × Light Sussex, bred at Cheras Agricultural Station, a Kampong hen and a pure-bred white Wyandotte cock, together with eggs from the hens were shown, to illustrate the great improvement in size of bird and egg, obtained by the use of a good cock of European blood.

Other exhibits included avocado pears, Brazil nuts, coffee and tobacco.

Co-operative Department. Methods of egg testing and grading were demonstrated.

Malayan Fertilisers. An interesting exhibit of manures suitable for every variety of crop, together with actual plants showing the effect of these manures was staged.

During the day a badminton tournament was held, a lecture on poultry keeping was given by Mr. W. H. Barnes and in the evening cinema films belonging to the Agricultural and Co-operative Departments were shown.

The show was not only a success from an agricultural point of view but also provided a very enjoyable day for the local inhabitants.

(*b*) Kuala Selangor District Show.

The second annual Kuala Selangor District Agricultural Show was held at the District Office, Kuala Selangor on Tuesday October, 17th. The show was opened by H.H. the Sultan of Selangor in the presence of the Hon'ble the British Resident, Selangor, the Directors of Agriculture and Co-operation, the District Officers, Kuala Selangor, Klang, Ulu Langat and Kuala Langat, a number of Government Officials from the Agricultural, Co-operative and Health Departments and a large gathering of Malays from all parts of the district.

There were 13 competitive sections providing classes for padi, minor economic crops, fruits, vegetables, oils and fats, rubber, poultry and home industries. The outstanding sections were those devoted to vegetables, oils and fats, poultry, and mats made from Mengkuang and Pandan—and although in the remaining sections, only a small number of exhibits were received, many of them were of excellent quality.

Besides the competitive sections special exhibits were put up by :—

Federal Oil Mills.—Samples of coconut oil and coconut poonac.

Raja Musa Estate.—Oil palm bunches and palm oil.

Nipah Distillers.—Sugar and Gula Nipah.

Messrs Guthrie & Co.—Izal disinfectant for Mouldy Rot and Chicken powders.

Malayan Fertilisers.—Exhibits of fertilisers suitable for padi, vegetables, fruits etc.

Health Department.—Models of ideal kampong houses, propaganda in connection with Malaria, Small-pox, Hook-worm (Ankylostomiasis), demonstrated by a series of microscope slides and illustrated posters.

Co-operative Department. Demonstration on how to test eggs and how to grade them.

Agricultural Department : Copra. Special exhibit of model copra kilns showing good and bad designs—together with samples of good and bad quality copra and oil produced on such kilns. Also samples of copra from good and bad kilns after storage for 4 months.

Padi. Exhibits of the following padi pests and their control measures—*Leptocorisa* sp., rats, stemborers.

Fruits. Exhibits of Brazil nuts and avocado pears along with instructions on methods of propagation and cultivation.

Poultry. Models of chicken houses, feeding trough, nest box and a coop for broody hens, all suitable for kampong use.

Attaps. Exhibits of good and bad quality attaps with the faults indicated.

In the afternoon a boat race for the Chinese ferrymen and a football match was arranged and attracted a large and enthusiastic crowd.

In the evening a film prepared by the Health Department was shown, followed by a lantern lecture on 'Copra' and by further films prepared by the Agricultural and Co-operative Departments.

The show was extremely successful and was even an improvement on the very high standard set in the previous year. This was mainly due to excellent organisation and to the experience gained from the previous show.

H. J. S.

Reviews.

Leefmans S. & van der Vecht J. Der Groote Agaatolak (*Achatina fulica* Fer) in Nederlandsche Indie- The Giant Snail in the Dutch East Indies De Bergcultures 27th May 1933.

The information in this interesting paper is drawn, to a great extent from existing literature. The economic importance of the giant snail (*A. fulica*) has been a subject for considerable discussion in recent years in Malaya and elsewhere, and it would appear that doubt still exists as to whether it can be ranked as a major pest. Indubitably, cases of damage, chiefly to recently planted out seedlings, frequently come to notice, but on investigation, apart from the annoyance naturally caused to a gardener by the loss of his plants, the actual harm done from an economic point of view, is of little account, and could, in a great many cases have been avoided had adequate care been take for the protection of the plants.

The increase of the snail is slow, and it is not unlikely that had control measures been initiated when it was first observed, some twenty two years ago, it would have been either exterminated or its range considerably more restricted than it is today.

A brief bibliography of recent literature is given in the paper.

N. C. E. M.

SISAL.

A Note on the Attributes of the Fibre and their Industrial Significance.

BY

S. G. Barker, Ph.D., D.I.C., F. Inst. P., M.I.C.E., F.R.S.E., F.Z.S., F.T.I., Bulletin No. 64 of the Empire Marketing Board. May 1933. Price 1s.

The purpose of this booklet is to call attention to the paucity of real scientific knowledge of the attributes and characters of the sisal fibre.

A brief survey of world production and of imports into Great Britain is given together with a note on methods of reproduction and harvesting practice in different countries. Figures are given to show the average composition of the ash of the leaves and of the average fibre content which appears to be influenced somewhat by numerous factors, such as age of leaf and dryness of habitat. Mention is made of the distribution and grouping of the fibres in the leaf and their suitability for direct mechanical extraction with the elimination of retting; while it is of historic interest to record that, in principle, the first machine, which was invented by a Franciscan friar and called the 'Raspador' is the basis of all subsequent machines used for extraction of this fibre.

In discussing decortication the necessity for a plentiful supply of clean water is stressed whilst, in drying the fibre, if artificial heat is employed, it needs careful adjustment to secure optimum conditions, regarding which much investigation is still desirable.

The nature of the fibre is discussed and tables (Tobler's) are given for grading the finished product according to colour, length and thickness of the fibres.

Tables of typical values on the chemical composition of fibres from different regions are included, together with notes on the methods employed in the estimation of those values and their utility in evaluating a sample.

There is an interesting section dealing with the microscopic characters of the fibres, their lignification, minute structure and such physical characters as ductility, rigidity, fineness, tensile strength, density and methods of differentiation from Manila fibre.

The properties of sisal which have led to its commercial application in cordage, twine etc. are mentioned and a plea is made for research in methods of treatment to render the fibre suitable for other uses and so to expand its commercial potentialities, especially since binder twine, one of the chief forms in which the fibre is utilised, is now a narrowing market owing to the extending use of combine harvesters in all the large grain growing countries.

An interesting comparison of some of the physical characters of sisal and manila when used as marine cordage under similar and exhaustive tests, shows that, while sisal rope absorbs water and swells more rapidly than manila, yet after protracted immersion, the differences in these respects became immaterial.

Referring to the Admiralty report wherein certain defects of sisal rope are cited as detrimental to its general adoption in the navy it is pointed out that arrangements are being made to use sisal for 50 per cent. of the towing, heaving and hauling lines and for its entire adoption in the manufacture of cordage for certain other purposes, while the defects mentioned, it is stated, are capable of elimination by scientific investigation and research.

Methods of softening sisal fibres are briefly discussed as it is suggested that, if the fibre could be satisfactorily softened, a variety of new uses could be found for it along paths which are at present closed on account of its hardness.

Possible new uses for sisal fibre are suggested including moulding materials, sacking, hat braid, matting, hammocks, brushes, shoe tops, paper, thermal and electrical insulation and power alcohol production from waste though most of these uses would not result in a high consumption of fibre. The need for research on the production and particularly on the utilisation of sisal fibre is stressed in order to enable it to compete in the world's markets especially in the direction of new uses on which progress in the industry must be based.

The booklet is a compendium of reliable up to date information and from it emanate many inspiring suggestions which should prove useful to research workers along various lines of enquiry.

H. W. J.

FROM THE DISTRICTS.

The Weather.

In Kedah, Province Wellesley and Penang Island in the north, and in Singapore Island and parts of southern and eastern Johore in the south there was a good rainfall which, especially in the north, was well up to the average for the month. In Perak the precipitation was below average, the deficiency becoming more marked towards the southern end of the State and merging into the very dry conditions experienced in Selangor, Negri Sembilan, Kelantan and Pahang. The deficiency of rainfall was somewhat less extreme in Malacca and parts of northern and central Johore, but in these areas the second half of the month was hot and dry.

On the east side of the Peninsula the north-east monsoon had not broken at the close of the month and was, therefore, late, although its influence was felt in the north-western area.

Remarks on Crops.

Rubber. The average price of rubber remained about the same as in September. The highest and lowest prices in dollars and cents per picul recorded during the month for rubber from small holdings were :—Smoked Sheet $9—$16.50; Unsmoked Sheet $7.50—$15.50; Scrap and Lump $1—$8. The average Singapore prices recorded for small-holders' rubber were :—Smoked Sheet $15.50; Unsmoked Sheet $14.50; Scrap $5 as compared with $15, $14 and $5.50 in September. The Penang prices for Unsmoked Sheet ranged from $12.60—$14.40 as against $11.50 to $13.50 in September.

There has been a still further and quite considerable increase in the number of both large and small holdings tapped in all parts of the Peninsula. This has been assisted by the completion of padi planting in several areas. Severe tapping on two or more panels was becoming common. As tapping is often done by the children, while the adults earn money in other ways, the actual work of tapping is often unskilfully performed. Consequently, trees are often severely wounded even on properties on which tappers, paid on the half-share system, are not employed.

Clearing of undergrowth to facilitate tapping caused some improvement in the appearance of small holdings. Somewhat better attention was given to the treatment of Mouldy Rot disease by owners and the use of approved cheap disinfectants showed an increase as facilities for obtaining them were further extended.

Padi. The price of padi at the Government Rice Mill, Bagan Serai, continued to be $1.70 per picul. There was a slight fall in price in Kedah towards the end of the month and in Province Wellesley the price was as low as $5.50—

$5.60 per 100 gantangs. Elsewhere prices showed little change from those of September and mostly ranged between 7 and 10 cents per gantang.

Padi planting was nearing completion in most parts of the Peninsula, though much work still remained to be done in several important areas, as for example Kuala Selangor district, Raub district in Pahang and several parts of Kelantan where unusually dry weather conditions have caused delay. Prospects for the coming harvest are very promising in Kedah, Province Wellesley, Krian, Malacca and parts of Pahang.

Two new rice mills have commenced work in Kedah. From this State it is also recorded that enquiries were made from Sumatra as to the possibility of obtaining hand-milled rice from the weekly fairs or in other ways.

It was observed in Johore that neighbouring padi planters were offering 20 cents a gantang, or twice the current market price, for seed of certain pure strain padis grown in an old sawah to which these strains were distributed by the Department of Agriculture five years ago. This is an interesting illustration of the demand that can arise for the seed of a pure strain once it has established a local reputation.

The fresh water crab common in parts of Kedah made its appearance as a pest of padi in the north of Province Wellesley. The pot traps and fish traps used in Kedah were employed for its control, but were not available in sufficient numbers, so that in the last resort water had to be drained off the fields and the crabs collected by hand. Rats proved troublesome in Negri Sembilan and even more so in Johore.

Coconuts and Copra. There was a further decline in the price of copra which averaged $2.65 per picul in Singapore and $2.60 in Penang. Prices in various centres ranged during the month from $1.40 to $3.25 with a maximum of $4.50 per picul in Kedah.

In spite of the fall in price the number of Malays who prepare their own copra is steadily increasing. The tour of the Rural Lecture Houseboat and the visit of the Copra Instructor to the villages along the Pahang river has roused considerable interest in copra preparation among the Malays of Temerloh and Pekan districts in the former of which three new kilns are being erected. This movement has also extended to the west coast of Johore and to part of Kelantan. In Selangor the quality of the copra is improving.

The price of copra is, however, so low that in some localities it is more profitable to sell the nuts for eating or, as in Malacca, to sell home-made coconut oil.

Pineapples. Harvesting of the second main crop for the year commenced towards the end of the month. Yields were small at first but increased rapidly. Three factories were working in Johore and two in Singapore. In the areas in Johore where they are planted as a sole crop pineapples appear to be growing well.

Tuba Root. The price of dried root in Singapore rose considerably during the month and at its close stood at $40 per picul for good root. This rise may be due in part to large orders for planting material received from intending planters mainly in Sumatra. A total of 61,500 cuttings were despatched to Sumatra and Pahang. Other enquiries have been numerous and some remain to be supplied.

Agricultural Stations.

At all Stations work, including the planting up or supplying of permanent crops, proceeded normally. Plots of one year old tea were pruned at Rembau Station and the final pruning was given in the experiments on pruning young tea at the Tanah Rata Station on Cameron Highlands. The results of these experiments indicate that on the Highlands the young bushes should be allowed to grow at least four months and for not more than seven between prunings. The wood to be left between cuts will then have to be about 1½ inches to bring the bushes to 9 inches high at the time of their final pruning before tipping. Tobacco curing was in progress at Kuala Kangsar and Temerloh Stations and also at the Pineapple Experiment Station, Singapore, where there is a barn for flue curing. Fruiting had commenced on all the plots of mature pineapples under experiment at this Station.

Padi Test Plots.

Planting was well advanced or actually completed on all Padi Test Plots except those in the Panchang Pedena area of Kuala Selangor district where transplanting was delayed by lack of water.

Harvesting of all varieties except F.S. 824 was completed at Kajang Test Plot in Selangor. Satisfactory yields between 340 and 495 gantangs per acre were obtained, the best varieties were F.S. 756 giving 495 gantangs per acre and Padi Kelantan with 446 gantangs per acre. F.S. 824 has proved to be of no use as an inter-season strain. Harvesting was also in progress at the Kuang Padi Test Plot in Selangor but was not completed for all strains. Yields were low owing to damage by pests the best strain so far being Radin Siak with a yield of 210 gantangs per acre.

Home Gardens Competitions.

Home gardens were judged finally in the Lenggong Sub-district of Upper Perak, there being 91 entries and the competition was considered to have been a distinct success. Similar competitions in the Klang and Kuala Langat districts of Selangor were completed successfully. Entries for competitions in Pahang East were 111 in Kuantan and 130 in Pekan district. The judges considered

the standard reached to be satisfactory. The competitions have aroused considerable interest in the growing of vegetables on Malay small holdings and such production is further stimulated if there are weekly fairs close at hand where surplus produce can readily be sold.

Weekly Fairs.

Weekly fairs remain popular and serve a useful purpose in most parts of the country. Two new fairs were opend in Kedah and two in eastern Pahang. In Klang district of Selangor, however, the fairs are not doing so well as in the inland areas, owing to the small number of outside buyers, the fact that the majority of the small-holders grow their own vegetables and the proximity of large villages and the town. In Muar district of Johore, just a year after weekly fairs were started, less than half a dozen survive out of seventeen originally opened, while it is doubtful if most of the surviving fairs are fulfilling their their correct purpose.

Bee Keeping.

Three wooden-frame hives of the standard size used in Java for *Apis indica* were presented to the Department of Agriculture, Kedah, by Mr. J. J. Ochse of the Department of Agriculture and Commerce, Netherlands India. In two of these local swarms of the bee have been placed for preliminary observations.

From Johore it is reported that a certain Chinese in Parit Ibrahim Ulu, Pontian, has established 15 hives of bees. The honey is collected once a month during full moon and one bottle per hive is said to be produced each month. The honey is sold to Chinese in the district for medicinal purposes at 30—45 cents per bottle.

It may be added that several exhibits of honey in bottles were shown at the Kuala Selangor District Show.

DEPARTMENTAL NOTES.

Visits and Tours.

The Director of Agriculture, Dr. H. A. Tempany, C.B.E., accompanied by the Chief Field Officer, Mr. F. W. South, attended the District Agricultural Show at Kajang on October 1st and at Kuala Selangor on October 17th.

The Agricultural Field Officer, Selangor, Mr. H. J. Simpson, also attended both Shows and the Assistant Economic Botanist, Mr. R. B. Jagoe, attended the Kajang Show to assist in judging the padi exhibits.

The Director proceeded to Singapore on October 12th and again on October 26th for the purpose of holding a Conference on matters connected with the Malayan Pineapple Industry. During these visits he conferred with the Hon'ble the Colonial Secretary and other officials.

On October 27th—28th the Director paid a visit to Malacca and inspected the work in progress at the Pulau Gadong Padi Experiment Station and the Agricultural Station, Sungei Udang, and conferred with the Hon'ble the Resident Councillor, The Inspector of Schools and the Agricultural Field Officer.

The Rural Lecture Caravan.

The Caravan proceeded to Kuala Lipis on August 8th 1933 and conveyed the necessary apparatus and exhibits for a tour of the riverine mukims of Kuala Lipis, Temerloh and Pekan districts by House-boat.

The tour, which continued until September 12th, was most successful and proved of considerable interest to the inhabitants of the scattered Kampongs in the neighbourhood of the centres visited.

Staff Changes and Leave.

Mr. J. L. Greig, Assistant Agriculturist, returned from leave and reported for duty in Kuala Lumpur on October 13th 1933.

Statistical.

MARKET PRICES

October 1933.

Rubber.—The price of rubber has fluctuated somewhat during the month, opening at 14¼ cents per lb. for Spot loose in Singapore and closing at 13 cents per lb. The average price for the month was 12 15/16 cents per lb. in Singapore, 3 31/32 pence in London and 7 9/16 cents Gold in New York as compared with 11 15/16 cents, 3 11/16 pence and 7 cents Gold respectively in September.

Palm Oil.—The course of the English market during October on a basis of 18 per cent., f.f.a., c.i.f. Liverpool was as follows:—October 5th £14.10.0. per ton, market weak, October 12th £14.0.0. per ton, market quiet, October 19th £14.15.0. per ton market steady and October 26th £15.0.0. per ton market firmer.

Prices in the U.S.A. landed weight per pound in bulk c.i.f. New York/Philadelphia were 2.70 cents Gold on the 7th October; 2.70 cents Gold on the 14th October; 2.50 cents Gold on the 21st October and 2.60 cents Gold on the 30th October.

The price of palm kernels Fair Average Malayan Quality c.i.f. landed weight on the continent was 7s. 6d. per cwt. on the 7th October; 7s. 6. per cwt. on the 14th; 7s. 7½d. per cwt. on the 21st October and 7s. 9d. per cwt. on the 30th October.

Copra.—There was again a slight fall in price when compared with ruling prices in the previous month, the highest Singapore price for Sundried during October was $3.30 per picul, and the lowest price $3.15 per picul, the average price per picul being $3.20 as compared with $3.42 per picul during September. The mixed quality averaged $2.60 per picul as compared with $2.87 in September.

Coffee.—The price at Singapore for Sourabaya coffee remained steady during the month, but there was a slight fall in prices as compared with the prices quoted in September. Prices ranged according to grade, from $16 to $18 as compared with $17.50 to $19.50 during September. Palembang coffee averaged $12.56 during the month being quoted at $12.50 on the 6th and $12.75 on the 27th, the average figure for October was $12.56.

Arecanuts.—Palembang's averaged $1.85 and Bila Whole $2 per picul as compared with $2.27 and $2.15 during September. The range of Singapore prices for other grades was:—Split $1.60 to $3.85; Red Whole $3 to $4.25; Sliced $6.50 to $8 and Kelantan $2.25 to $3.

Gambier.—There was a further slight fall in the price of Block Gambier during October, the average price being $4.33 per picul, Cube No. 1 averaged $7.50. Corresponding figures for September were $4.50 and $7.50 respectively.

Pineapples.—Values decreased slightly during October, the average Singapore price per case being as follows:—Cubes $3.15, Sliced Flat $3.08 and Sliced Tall $3.20 as compared with $3.30, $3.30 and $3.30 during September.

Tapioca.—The price of Flake Fair averaged $4.41 as compared with $4 in September. Pearl Seed averaged $5.26, a slight increase over September price of $5, and Pearl Medium averaged $5.46 the average price being $5 in the previous month.

Sago.—Pearl—Small Fair declined further in price, averaging $3.81 during the month. Flour-Sarawak Fair averaged $1.72½ as compared with $1.77 in September.

Mace.—Prices ruling during the month were similar to September prices, namely $70 per picul for Siouw and $50 for Amboina.

Nutmegs.—Prices continued steady, after a fall in value in the first part of the month. Singapore price per picul for 110's was $19 and 80's averaged $25 having averaged $26 in the previous month.

Pepper.—Average Singapore prices during October were as follows:—Singapore Black $12.83 per picul; Singapore White $22.41 and Muntok White $22.87, the corresponding figures for September were $13.12, $21.94 and $22.56 respectively.

Cloves.—As in the previous months the demand for cloves remains small, nominal prices being $40 for Zanzibar and $45 per picul for Amboina.

GENERAL RICE SUMMARY.

Malaya.—Gross foreign imports of rice (including stocks available for re-export) during September 1933, amounted to 47,960 tons, as compared with 54,548 tons in September 1932, of which 45 per cent. were consigned to Singapore, 15 per cent. to Penang, 8 per cent. to Malacca, 22 per cent. to the Federated Malay States and 10 per cent. to the Unfederated Malay States.

Of these imports, 59 per cent. were from Siam, 38 per cent. from Burma, 2 per cent. from Indo-China and 1 per cent. from other countries.

Total foreign exports of rice from Malaya in September 1933, were 13,368 tons (including 177 tons local production) as compared with 15,345 tons in September 1932.

Of these exports 76 per cent. were consigned to Netherlands India and 24 per cent. to other countries.

Net imports for the period January to September 1933, were 315,871 tons as compared with 306,338 tons during the same period for 1932, an increase of 3.1 per cent.

India and Burma.—Total foreign exports of rice during August 1933, were 159,000 tons as compared with 131,000 tons in the previous month and 113,000 tons in August 1932.

Total exports during the period January to August 1933 were 1,465,000 tons as compared with 1,650,000 tons for the corresponding period of 1932, a decrease of 11 per cent.

Siam.—Exports (approximate) during September 1933, amounted to 126,942 tons as compared with 131,255 tons in September 1932, a decrease of 3 per cent.

Netherlands India, Java and Madura.—For the period end of August 1933, the area harvested amounted to 8,150,000 acres a decrease of 14,000 acres or 0.2 per cent. as compared with the corresponding period of 1932 : the area damaged was 420,000 acres an increase of 93,000 acres or 28 per cent. as compared with 1932, and additional plantings awaiting harvesting amounted to 1,297,000 acres an increase of 68,000 acres or 15 per cent. The total acreage at the end of August 1933, amounted to 9,867,000 acres, an increase of 246,000 acres or 3 per cent. as compared with the same period in 1932.

Imports of rice into Java and Madura January to July 1933, totalled 104,149 tons, an increase of 5,099 tons or 5 per cent. as compared with the same period of 1932.

Imports of rice into the Outer Provinces January to July 1933, amounted to 151,585 tons, an increase of 7,251 tons or 5 per cent. as compared with the same period of 1932.

French Indo-China.—Entries of padi at the port of Cholon from January to September 1933, amounted to 910,000 metric tons, an increase of 27,000 tons or 3 per cent. as compared with the same period of 1932.

Exports of rice from Saigon for the period January to September 1933 totalled 1,035,000 tons, an increase of 130,000 tons or 14 per cent. as compared with the corresponding period of 1932.

Ceylon.—Imports for the period January to August 1933, totalled 298,886 tons, a decrease of 11,252 tons on the imports for the same period of 1932.

Of these imports 19 per cent. were from British India, 81 per cent. from other countries.

Europe and America.—Quantities of rice shipped from the East were :—

(*a*) To Europe for the period January 1st to September 21st, 1,028,482 tons, an increase of 224,013 tons or 28 per cent. as compared with the same period of 1932. Of these shipments 51 per cent. were from Burma, 2 per cent. from Japan, 39 per cent. from Saigon, 7 per cent. from Siam and 1 per cent. from Bengal, as compared with 54 per cent. from Burma, 3 per cent. from Japan, 36 per cent. from Saigon, 4 per cent. from Siam and 3 per cent. from Bengal in 1932.

(*b*) To the Levant, period January 1st to August 26th, 21,087 tons, a fall of 22,643 tons or 52 per cent. as compared with the same period of 1932.

(*c*) To America and the West Indies for the period January 1st to August 21st, 1933, 119,703 tons, an increase of 25,223 tons or 27 per cent. as compared with the same period of 1932.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING September 1933.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1932	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		Total (3) + (5)	Percentage of (7) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
STRAITS SETTLEMENTS :—							
Province Wellesley	44,734	1,447	3.2	8,415	18.8	9,862	22.0
Dindings	6,969	209	3.0	950	13.6	1,159	16.6
Malacca	111,780	4,995	4.4	18,456	16.5	23,451	20.9
Penang Island	1,635	626	38.3	255	15.6	881	53.9
Singapore Island	28,269	10,560	37.3	4,656	16.5	15,216	53.8
Total S.S. ...	193,387	17,837	9.2	32,732	16.9	50,569	26.1
FEDERATED MALAY STATES :—							
Perak	250,951	7,484	3.0	35,449	14.1	42,933	17.1
Selangor	308,379	9,312	3.0	41,224	13.4	50,536	16.4
Negri Sembilan	228,541	8,116	3.5	22,526	9.9	30,642	13.4
Pahang	38,141	6,145	16.1	5,165	13.5	11,310	29.6
Total F.M.S. ...	826,012	31,057	3.8	104,364	12.6	135,421	16.4
UNFEDERATED MALAY STATES :—							
Johore	325,747	26,683	8.2	34,500	10.6	61,183	18.8
Kedah (*a*)	114,551	5,254	4.6	8,984	7.8	14,238	12.4
Kelantan	21,175	6,825	32.2	2,272	10.7	9,097	42.9
Trengganu (*b*)	4,352	Nil	Nil	2,072	47.6	2,072	47.6
Perlis (*a*)	957	177	18.5	468	48.9	645	67.4
Total U.M.S. ...	466,782	38,939	8.3	48,296	10.3	87,235	18.6
TOTAL MALAYA ...	1,486,181	87,833	5.9	185,392	12.5	273,225	18.4

Notes :— (*a*) Registered companies only and are rendered quarterly.
(*b*) Registered companies only.

The above table together with a Summary, was prepared and published by the Statistics Department, S.S. and F.M.S. in October 1933.

MALAYAN AGRICULTURAL EXPORTS, SEPTEMBER 1933.

Product	NET EXPORT IN TONS.				
	Year 1932	Jan-Sept. 1932	Jan-Sept. 1933	Sept. 1932	Sept. 1933
Arecanuts ...	20,280	15,441	14,930	1,826	1,417
Coconuts, fresh † ...	108,123	89,970	78,454	6,726	10,388
Coconut oil ...	11,932	8,132	13,048	812	1,289
Copra ...	97,464	65,951	73,037	10,772	12,492
Gambier, all kinds ...	2,925	2,404	1,802	301	165
Palm kernels ...	1,248	843	1,433	91	285
Palm oil ...	7,892	5,398	7,118	851	988
Pineapples, canned ...	66,291	54,464	49,718	3,735	2,873
Rubber § ...	417,137	305,511	331,796	33,315	39,897
Sago,—flour ...	10,267	6,562	2,605	1,336	245*
„ —pearl ...	3,128	2,136	1,644	248	214
„ —raw ...	4,148*	3,028*	3,070*	332*	421*
Tapioca,—flake ...	9,028	7,193	7,950	868	711
„ —flour ...	392	191*	195*	1*	69*
„ —pearl ...	19,977	15,371	12,932	1,459	1,324
Tuba root ...	165½	98	343½	15	30

† hundred in number. § production. * net imports.

MALAYAN PRODUCTION IN TONS OF PALM OIL AND KERNELS THIRD QUARTER, 1933.

(As declared by Estates).

	Palm Oil		Palm Kernels	
	F.M.S.	Johore	F.M.S.	Johore
1933 July ...	883.9	334.6	141.1	110.5
August ...	1147.3	559.5	188.9	127.0
September ...	1128.7	302.1	180.5	56.9
TOTAL ...	3159.9	1196.2	510.5	294.4

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF SEPTEMBER 1933 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		January to Sept 1933		during the month		January to Sept. 1933				
	Ports	Dealers	Estates of 100 acres and over	during the month	January to Sept. 1933	during the month	January to Sept. 1933	Foreign	From Malay States Labuan	Foreign	From Malay States Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	13,270	11,744	11,725	100,222	9,807	79,630	Nil	Nil	Nil	Nil	14,533	7,394	126,720	56,356	...	13,084	11,520
Johore ...	...	3,211	3,036	3,469	32,031	4,575	39,073	Nil	16	Nil	115	1,715	6,692	12,182	59,139	...	3,158	2,742
Kedah ...	...	464	2,077	2,610	20,970	1,378	12,057	Nil	Nil	Nil	Nil	1,356	2,602	11,059	22,665	...	437	2,134
Perlis ...	...	15	11	12	71	21	108	Nil	Nil	Nil	Nil	Nil	36	Nil	201	...	11	12
Kelantan ...	...	331	199	227	1,606	710	4,930	Nil	Nil	330	Nil	103	816	702	5,897	...	323	225
Trengganu ...	...	55	50	182	1,186	91	592	Nil	Nil	Nil	Nil	Nil	273	Nil	1,778	..	55	50
Total Malay States	...	17,346	17,117	18,225	156,086	16,582	136,390	Nil	16	330	115	17,707	17,813	150,663	146,036	...	17,068	16,683
STRAITS SETTLEMENTS :-																		
Malacca ...	...	3,277	1,270	1,396	11,806	2,893	20,632	1	17,871	11	146,527	3,403	Nil	35,621	Nil	...	3,455	1,255
Province Wellesley	...	1,167	728	540	4,618			Nil		Nil						...	1,151	761
Dindings ...	...	28	138	115	888			Nil		Nil		6,850		57,363		...	47	170
Penang ...	1,362	5,521	12	11	41			1,165		6,298						1,571	5,511	12
Singapore ...	8,253	31,502	145	135	1,335			10,298		78,657		21,647		156,585		9,536	30,185	134
Total Straits Settlements	9,615	41,495	2,293	2,197	18,688	2,893	20,632	11,464	17,871	84,966	146,527	31,900	Nil	249,569	Nil	11,107	40,349	2,332
TOTAL MALAYA	9,615	58,841	19,410	20,422	174,774	19,475	157,022	11,464	17,887	85,296	146,642	49,607	17,813	400,232	146,036	11,107	57,417	19,015

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	9,670	25,784	5,075	4,431	1,480	159
WET RUBBER	3,414	4,401	436	222	1,678	278
TOTAL ...	13,084	30,185	5,511	4,653	3,158	437

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Sept. inc. 1933
Singapore ...	31,651	244,327
Penang ...	10,979	92,293
Port Swettenham.	5,933	54,698
Malacca ...	1,044	8,914
MALAYA ...	49,607	400,232

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to Sept. inc. 1933
Malay States ... / Straits Settlements	37,245	316,770
MALAYA ...	37,245	316,770

Notes:—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + 15 tons local consumption during the month — [2] — [3] — [4] — [5] — [9] — [10]. For the Straits Settlements, Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25 %; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5 The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd October 1933.

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1933.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day	Number of days					Total	Daily Mean	Per cent
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	89.8	71.6	80.7	93	69	86	74	84.1	84.9	7.77	197.4	2.05	18	16	6	6		169.40	5.65	47
Bukit Jeram, Selangor ...	88.6	72.8	80.7	91	71	85	75	84.6	86.2	4.80	121.9	2.48	13	9	3			196.20	6.54	54
Sitiawan, Perak ...	90.5	72.8	81.7	94	70	86	74	85.0	85.6	4.25	108.0	1.62	14	9	1			194.55	6.49	54
Kroh, Perak* ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Temerloh, Pahang ...	89.6	71.8	80.7	92	69	86	74	83.9	86.0	12.06	306.3	2.31	22	17	1	5		190.05	6.33	52
Kuala Lipis, Pahang ...	88.9	71.2	80.0	92	69	83	74	84.4	85.3	6.43	163.3	2.65	15	12	3	22		190.10	6.34	52
Kuala Pahang, Pahang ...	87.1	73.0	80.1	92	70	83	75	84.3	85.4	7.47	189.8	2.65	16	12	3		2	208.10	6.94	57
Mount Faber, Singapore ...	87.0	73.8	80.4	92	69	79	79	82.4	83.3	6.03	153.2	1.75	18	13	5			176.20	5.87	49
Butterworth, Province Wellesley ...	87.8	73.8	80.8	90	71	83	75	84.4	85.2	10.74	272.8	1.44	23	18	1			198.55	6.62	55
Bukit China, Malacca ...	84.4	73.4	78.9	87	70	80	76	82.6	84.0	12.25	311.2	2.92	18	16	7			173.30	5.78	48
Kluang, Johore ...	86.9	70.9	78.9	92	69	78	73	81.5	82.0	7.54	191.5	2.16	16	12	2	6		145.80	4.86	40
Bukit Lalang, Mersing, Johore	87.0	71.5	79.3	91	68	77	74	81.5	82.0	7.39	187.7	1.26	16	15	7	1		181.35	6.05	50
Alor Star, Kedah ...	87.6	74.0	80.8	90	71	83	77	86.1	86.1	6.48	164.6	0.94	23	21	4	1		197.75	6.59	54
Kota Bahru, Kelantan ...	89.3	73.1	81.2	93	70	82	76	84.5	85.3	9.45	240.0	1.90	22	18	2			194.15	6.47	53
Kuala Trengganu, Trengganu	87.9	72.2	80.1	90	68	84	75	83.4	84.8	5.97	151.7	1.67	16	13	1			189.95	6.33	52
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	74.8	62.6	68.7	78	60	71	65	71.4	72.0	5.78	146.8	1.90	17	12	2	9	2	155.60	5.19	43
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.7	56.8	64.3	75	53	69	62	70.4	69.7	3.85	97.8	1.39	16	13		3	1	141.90	4.73	39
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ..	71.4	59.0	65.2	75	57	68	61			4.09	103.9	1.43	15	12		1		147.45	4.91	41

Compiled from Returns supplied by the Meteorological Branch, Malaya

*This Station has been dismantled